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Forthcoming Events.

JUNE 10-19.

International Foundry Trades' Exhibition:—Royal Agricultural Hall, London, N.1.

JUNE 19-26.

South Wales Institute of Engineers:—Summer meeting in North Wales.

JUNE 21-23.

Institution of Heating and Ventilating Engineers:—Summer meeting at Scarborough.

JUNE 23-25.

Newcomen Society:—Summer meeting at Norwich.

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

Institute of British Foundrymen

PRESIDENT, 1925-26: John Cameron, Kirkintilloch, near Glasgow.

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Wales and Monmouth Branch: J. J. McClelland, M.I.Mech.E., Druslyn, Bishops Road, Whitechurch, Glam.

Welsh Engineers' and Founders' Association.

Secretary: F. J. Griffiths, 20, Fisher Street, Swansea.

Foundry Trades Equipment & Supplies Association.

Secretary: K. S. Bridges, Avenue Chambers, Southampton Row, London, W.C.1.

The Exhibition.

To-day sees the opening of the fourth foundry exhibition held in Great Britain, and though obviously slightly influenced by the coal strike, will be larger and more representative than any previous one. A core weighing 2½ tons, made from oil-sand, has safely arrived and is typical as showing the advance made in recent years in foundry practice. There are still numerous foundries that would hesitate to make a core of oil sand weighing much more than a few pounds, yet important foundries find it economical to incorporate oil sand cores in their largest moulds.

Of outstanding interest are the exhibits relating to conveying. Those who sell moulding machines are being forced to interest themselves in this phase as they are conscious of the limitations which are being imposed on their installations through the inability either to receive sufficiently quickly the raw materials for the mould or to dispatch in an adequate manner the finished mould. At the Exhibition efforts emanating both from the moulding machine manufacturer and the conveyor maker are on view.

The reclaiming of magnetisable metals is of increasing importance as time passes, not so much for the value of the iron so salved, but from the purification of the material of which it forms an impurity. It also often safeguards handling plant. Machinery of several types is shown tackling these various problems.

The old-time mortar mill, which has served during many decades for the preparation of sand, is doomed. Many types are shown at the Exhibition, but there is only one plant which allows the runner wheels to run on the pan, and in this case the wheels are so light that grain crushing is avoided.

The old-time riddle is also being superseded by mechanical contraptions, and numerous varieties are being shown. Judging from the numerous exhibits of scientific apparatus, it would appear that there now remains but little excuse for the rule-of-thumb practice to continue. No industry has more to gain than the foundry industry by the intense application of scientific control. A commendable state of affairs exists, in as much as the manufacturers of scientific instruments have such a keen realisation of the needs of the industry, and we look forward to the time when all foundrymen will reciprocate by taking as keen an interest in the apparatus available.

We congratulate the organisers and exhibitors on having surmounted all difficulties and placed at the disposal of foundrymen the most interesting Exhibition ever staged for their instruction. It now only remains for the members of the foundry industry to be equally courageous, and ignore the present difficulties which are but a passing phase and look well into the future. It cannot be worse, and when good times come, as come they must, the enterprising foundryman will be in a position to reap the maximum amount of benefit from it, with a minimum expenditure of energy.

G

The Making of "Sterling" Boxes.

Our representative was recently afforded an opportunity of inspecting the new works of the Sterling Foundry Specialties, Limited, of Bedford. The works were put up in 1922, and are now being extended. They are confined solely to the manufacture of rolled steel foundry moulding boxes. At first thought it would seem simplicity itself to arrange for efficient production of such a article, but experience has shown that owing to the necessity of incorporating each particular foundryman's ideas in his boxes there is not, and cannot be, a standard moulding box.

The works are laid out for the rapid and accurate production of all types of boxes, and the

FIG. 2.—SHEARING PRESS AND GAUGING BENCH

plant lay-out is shown in Fig. 1. Raw material is taken into the works at the railway siding end of the building, and advances operation by operation to the opposite end, where the finished boxes are crated for delivery. The works are conveniently situated on sidings connected with the L.M.S. Railway, the unloading of the trucks being done by Telpher crane. The main raw material consists of channel-shaped steel bars of the well-known Sterling section. These are made from the best English mild steel, rolled by means

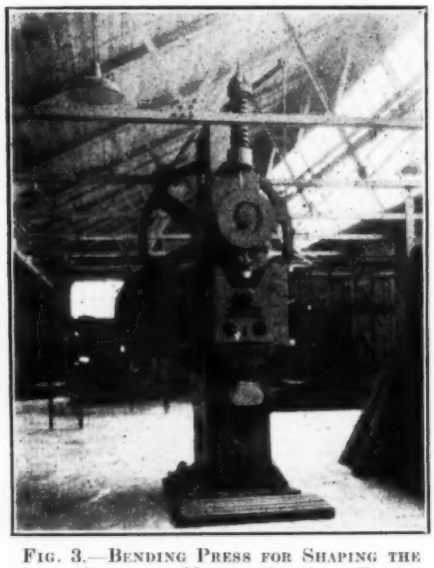


FIG. 3.—BENDING PRESS FOR SHAPING THE STEEL STRIP FOR MAKING STERLING BOXES.

of rolls supplied by the Sterling Company. The stores end of the building adjacent to the siding is really a series of doors (Fig. 1) which give direct access to the storage bins. The other main raw material consists of whiteheart malleable castings stored in bins.

In the making of boxes the steel channel bars are first sheared to the required length and gauged for bending. The shearing press and gauging bench are shown in Fig. 2. The bars are then bent to give the required box form on a special bending press (Fig. 3). The formed box parts are then laid out for attaching the malleable fittings by riveting. Sensitive high-speed drill presses are used for drilling all the rivet holes. All the fittings are then attached securely by machine riveting. Each part is next straightened and squared up. A special grinding machine (Fig. 4), having a large horizontally revolving grinding disc, is installed for grinding the parting surfaces of the box parts to a true plane. This machine has a capacity for grinding true the parting surfaces of the largest boxes. The boxes are then clamped in position on a specially adapted jig-guided drilling machine for drilling the pin-holes. By the use of a series of gauges for the drilling operations boxes can always be guaranteed to be interchangeable, no matter what period intervenes between two orders. A special pin-setting machine is used for setting the pins in place in a definitely vertical position so that they will be square with the parting plane. Pin-holes are made to allow for an easy fit—one sixty-fourth of an inch over the pin size—but finer limits can be worked to. Pin-holes can also be furnished with hardened steel bushes pressed into place or run with brass or white metal, and then reamed to size.

All of the various operations are done by machinery, most of which is specially designed for

FIG. 4.—GRINDING MACHINE FOR MAKING STERLING BOXES.

the operation required. The shearing press (Fig. 2) and the riveting presses were made by J. Concord & Company, and Scriven & Company (Leeds) designed and built the bending press (Fig. 3). The horizontal disc grinder (Fig. 4) was furnished by Cunliffe & Croom, Manchester. All the machines are motor driven, either direct-coupled or belted to motors set overhead.

Referring back to Fig. 1, one can follow readily the successive operations incident to the formation of the boxes. The requisite material is drawn from the stores end of the building, and travels in a straight line to the opposite end.

At the time of our representative's visit there were numerous orders in production, from quite small boxes less than a foot square to large trunnion-type boxes for the production of motor-cylinder-block castings. In some of the boxes various shaped bars were being fitted for additional sand support to that obtained from the channel steel sand ledges of each box part.

The shop, at present 195 ft. long by 77 ft. wide, is substantially constructed and designed so that extensions can be made without altering the original plan and routine of the work. Ample land has been acquired, and is available for further extensions as required. The lighting of the shop is excellent. It is cool in summer and warm in winter. A series of overhead heating coils ensure comfortable working conditions during the winter. The production of the plant is now sixty sets of boxes daily, but the capacity is shortly to be increased to well over a hundred.

For a small engineering factory we know of no better equipped and laid out installation than the one under review.

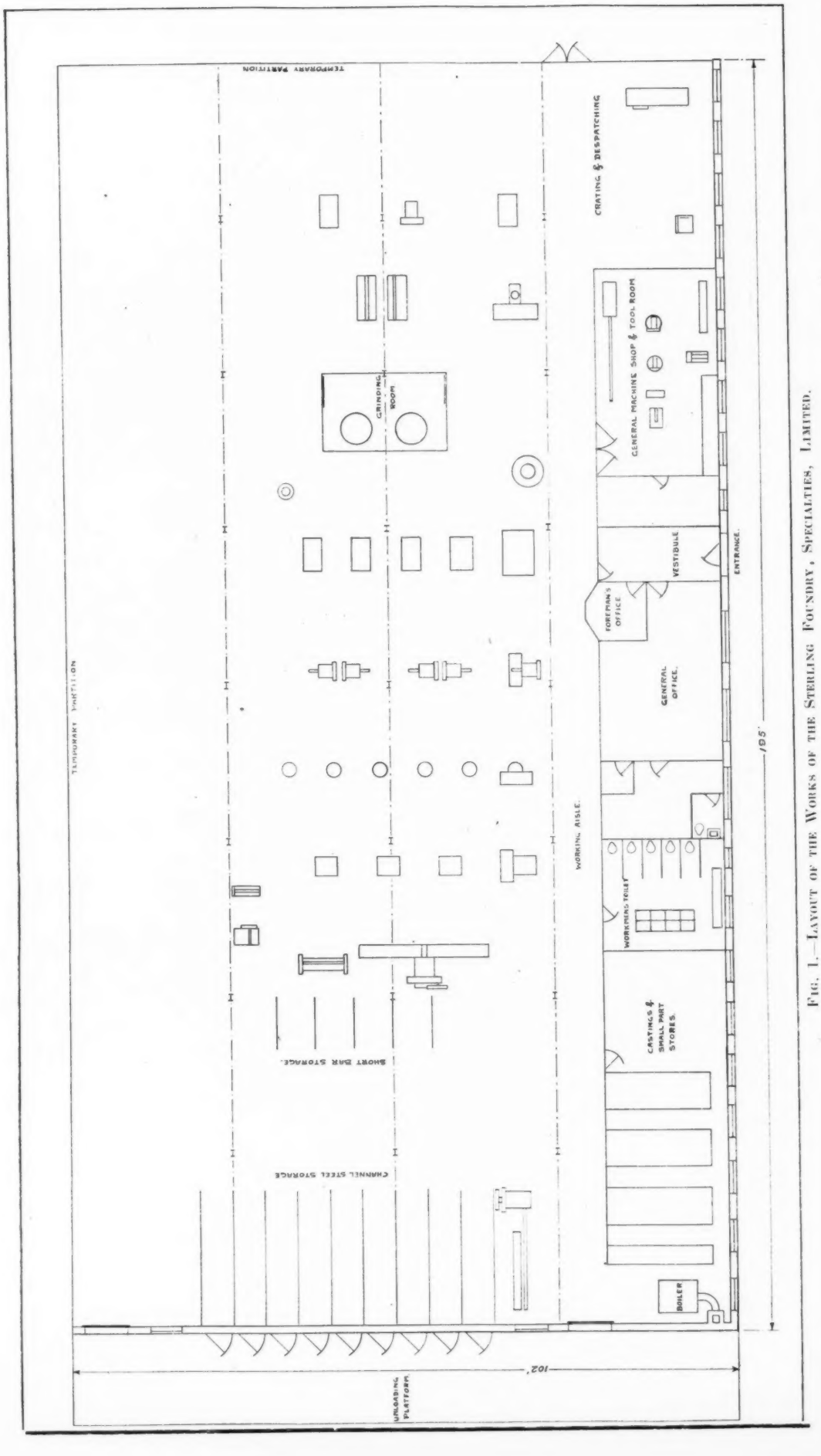


FIG. 1.—LAYOUT OF THE WORKS OF THE STERLING FOUNDRY, SPECIALTIES, LIMITED.

Institute of British Foundrymen.

BIRMINGHAM, COVENTRY AND WEST MIDLANDS BRANCH.

The annual meeting of the Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen was held at the Engineers' Club, Waterloo Street, Birmingham, the President (Mr. D. H. Wood) in the chair.

The Hon. Secretary (Mr. H. James Roe) read the Council's report for the year 1925-26, which recorded considerable progress. Attention was called to the alteration of the title of the Branch to include Coventry, and the absorption of the members of the former Coventry Branch. The hope was expressed that as the outcome of the visit, last November, of M. Ronceray, and the representative meeting of foundrymen then held, a model foundry would be established at an early date, probably in the Midlands, for the training of young foundrymen. During the year ten meetings were held, including two at Coventry, the Papers, with one exception, being given by members of the Branch. Members have also given Papers during the session before practically every other Branch of the Institute. Appreciation was expressed of the assistance rendered by Messrs. W. & T. Avery, Limited, in allowing the free use of their Club Room for the meetings. There were visits to the works of Messrs. Sterling Metals, Limited, and Messrs. Morris Engines, Limited, to whom thanks were tendered for allowing an inspection of their modern plants. While two informal meetings had been held, the formation of a Junior Section was not yet an accomplished fact. With the improvement in the finances, however, the Council looked forward to the realisation of its hopes in this respect during the forthcoming Session. Mr. F. J. Cook was thanked for his services in connection with the informal meetings. A successful outing and dinner took place during the year. The attendances at the meetings had been below the usual standard. During the year the following increase in membership had been made:—One subscribing firm, 19 members, 26 associate members and 10 associates, which included 10 transfers. The losses had been:—By transfer, 3 associate members; and by resignation and removal, 3 members and 9 associate members. The total membership at present was 174, compared with 118 last year, the net increase being 56. In terms of financial gain the increased income amounted to £58 3s. 6d. As a result of efforts which were being made by former officers of the Coventry Branch, it was hoped that during next session the Branch would benefit by the full accession of the former Coventry members. To date, unpaid subscriptions for the year 1924 amounted to £8 18s. 6d., and for 1925 to £41 7s. 6d. It was gratifying to note that, according to the latest figures, the Branch had the smallest arrears of any Branch. Regret was recorded at the resignation from membership of the Council of Mr. H. Parsons on removal to South Wales; Mr. E. Longden, on removal to Yorkshire; and Mr. A. Marks, on taking up an important appointment in Chile. At the commencement of the session there was a deficit on the Branch funds of approximately £50, in addition to which the expenses of the first half of the session had to be met. A special appeal to ironfounders and allied trades was made, as a result of which subscriptions amounting to £18 13s. were received. An appeal was also made for subscriptions to a delegate levy fund. As a consequence of the economies effected and the replies to their appeals, there were now funds in hand which, with the subscriptions due, would more than meet the expenditure for the coming year. Granted the full support of the members and their individual assistance in obtaining new members, the Council felt that next year should mark a definite stage in the advancement of the Branch towards the position of the strongest and healthiest Branch of the Institute. The Council made special acknowledgment of the President's successful efforts to improve the financial position and of the valuable services of the Secretary.

The report was adopted, on the proposition of MR. F. J. COOK, seconded by MR. CURNOW.

The statement of accounts, which showed a balance of approximately £50, was also approved.

On the motion of MR. STARR, seconded by MR. TYSON, Mr. D. H. Wood was re-elected President.

MR. WOOD mentioned that twenty years ago that night the first annual meeting of the Birmingham Branch was held, and at least one representative of the old Association was present in the person of Mr. F. J. Cook, who would probably be able to tell them that some progress had been made so far, at any rate, as membership was concerned. Now that the Branch had freed itself from financial burdens they would be able, he hoped, to set to work in real earnest and make definite progress. He thanked the members for their loyal support, and tendered special thanks to the Vice-President, Secretary, Treasurer and members of the Council.

Mr. F. G. Starr was re-elected senior Vice-President and Mr. E. H. Tyson junior Vice-President.

Mr. F. K. Neath was appointed to succeed Mr. Roe as Secretary, with Mr. E. M. Curnow, of Coventry, as Assistant Secretary, and Mr. G. E. Dicks was again asked to act as Treasurer.

Messrs. H. J. Roe, J. G. Pearce, James Moore, Jubilee, and Lewis were appointed members of the Branch Council.

The following were elected delegates to the General Council: Messrs. Johnson, Starr, Pearce, and Edwards.

The thanks of the Branch were accorded to the officers and members of the Council for their services during the past year.

MR. F. J. COOK, as one of the founders and a past-President of the Institute, presented a diploma to Mr. D. Wilkinson for his Paper on the subject of malleable cast iron, and to Mr. F. C. Edwards, whose Paper dealt with contraction stresses.

The "John Wilkinson" Medal Examination.

The second annual examination for the "John Wilkinson" medal (which is awarded each year to a member of the Junior section of the Lancashire Branch of the Institute of British Foundrymen) was held in the College of Technology, Manchester, recently.

As was the case last year, the subject of the award was a written examination paper. Questions on ironfounding, core-making, non-ferrous metal founding, general metallurgy, and pattern-making were the subjects covered by the first part of the paper. The second part was on general knowledge, these questions being answered in essay form in about 250 words. The first part of the paper was on the same novel lines as last year. One correct as well as two incorrect answers to the questions were given, and the candidate had to place a cross against the answer which he considered to be the correct one. In this way much writing was eliminated.

Fifty-three members sat for the examination, the result of which will be published in the near future.

Pulverising Coal.—For quick combustion and high temperatures, coal should be pulverised to a fineness of not less than 85 per cent. of the total through a 200-mesh and 95 per cent. of the total through 100-mesh. It is very important that the coal be absolutely free from any moisture or dampness.

Plaster of Paris Patterns.—When making plaster patterns, it is sometimes found that it sets too slowly, especially when that particular pattern is a "rush job." An addition of 10 per cent. of lime will greatly reduce the time taken in setting. On the other hand, a small quantity of ordinary glue added to the water used in mixing will retard the setting to a great extent.

Patternmakers' Varnish.—Yellow varnish sometimes changes to a muddy colour, through leaving the cover off the varnish pot. It is unnecessary to throw it away when in this state, as the addition of a small quantity of powdered oxalic acid, well stirred whilst being added, will restore it to its natural colour in a few minutes. If, when using a new brush, the brush is steeped in alcohol for a few hours, much better results will be obtained.

Reclaiming Metals Magnetically.

The reclaiming of magnetisable metallic substances from aggregates of various types is receiving the ever-increasing attention of foundrymen, and although a few equipments are operating here, it is as difficult to find one in a British Isles foundry as it is to find a foundry without one abroad, particularly in America and Germany. Generally, the equipments are for minimising labour, by mechanically handling used foundry sand, during which operation the iron content is automatically extracted for its value and good sand is sieved out for re-use, thus considerably decreasing the waste for carting, tipping space, and new sand required. Obviously, the type and size of plant will vary according to the output, and taking the case of a large foundry where a considerable quantity of sand is used, it necessarily follows that the handling plant may be extended profitably with supplementary handling arrangements for conveying the sieved sand to storage hoppers automatically, and thence to mixers if necessary, whilst it may pay to pulverise the over-size material consisting of hard core-sand and the like, finally delivering the material again to the elevator, so that a further proportion of good sand can be salved by sieving.

Where the quantity of sand to be dealt with is small, as would be the case in a little foundry, such expensive handling arrangements as suggested are prohibitive, and the problem would possibly boil down to the installation of a small combined separating and sieving apparatus, capable of being fed manually by means of a shovel. The extracted iron, sieved sand, and over-size material would be discharged separately down suitable shoots arranged at a height above ground, so that wheelbarrows should be placed underneath for their reception.

In the case of a foundry where ferrous and non-ferrous castings are produced, it is best, although not always possible, to keep the used sand separate, in which case the sand containing the iron can be treated with the small outlined equipment, whereas the sand containing the brass can be finely sieved, the over-size material and ultimate discarded sand being treated effectively on a wet concentrator. Where the sand to be treated is a mixture of used sand after ferrous and non-ferrous castings have been produced, modified apparatus is available for salving the iron and brass for its value, which at the same time would introduce various economies.

The method of handling the sand by means of these equipments varies according to the conditions obtaining, and broadly speaking, if the sand is wet, fine sieving takes place prior to separation on account of the difficulty of the damp sand clogging; on the other hand, the process is reversed where the sand to be dealt with is dry, or nearly so.

In all the equipments described, it is necessary to fit a magnetic separator which extracts the iron, and it will be found in many foundries an advantage to instal one of the many types available as a prevention against damage to pulverising and mixing machines, even if the question of a complete foundry plant is ruled out.

The only firm in the British Isles specialising in the design and manufacture of this type of equipment is the Rapid Magnetting Machine Company, Limited, of Lombard Street, Birmingham, who have made a special study of these equipments for use in foundries for the past quarter of a century, and to whom we are indebted for this article. Their works are adequately equipped to manufacture, and they employ a technical and designing staff for submitting schemes.

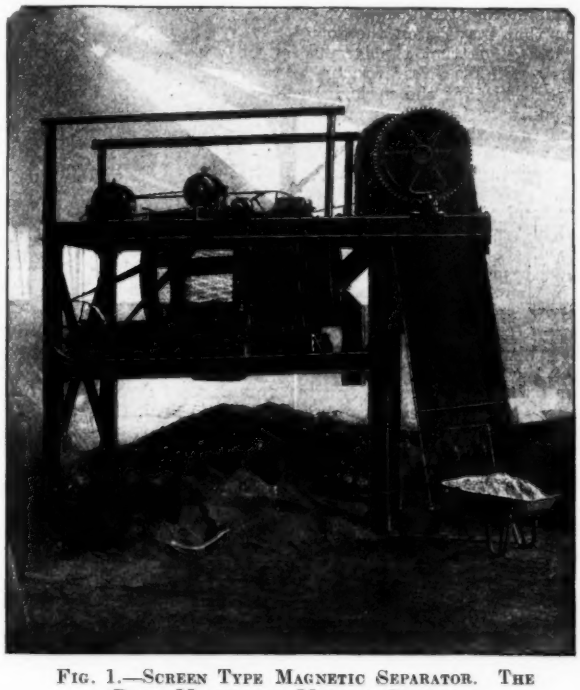


FIG. 1.—SCREEN TYPE MAGNETIC SEPARATOR. THE RAPID MAGNETTING MACHINE COMPANY.

The type of magnetic separator most suitable for the treatment of foundry sand is shown in Fig. 1.

Screen Type Separator.

This separator is arranged to fit clear of an extension cylinder fitted to a rotary screen, and consists of multiple unit coils on solid steel formers, clamped between high-permeability steel cheeks, the whole supported by non-magnetic cast-iron feet on suitable channels. The coils are totally enclosed and rated for continuous duty and the design is such that should a coil through any cause whatsoever give trouble, it can be disconnected and taken out without removing or disturbing the separator, which can still be left in effective operation until a spare is obtained.

There being no revolving parts, wear and tear is thus practically nil. A current-collector gear is not required and the windings are not under mechanical as well as electrical stresses. The chief claim for the efficiency of this separator is the effect produced by the magnetic feelers which are fixed to the inside face of the revolving screen, and travel parallel to the main pole faces. These are magnetised inductively, and stir up the sand in the vicinity of the separator. Thus whilst combing through the material, the iron is searched out and the separator has considerably more chances of picking up the iron than is the case with the drum type.

Another strong point in favour of the screen type separator is that advantage is taken of the retentivity in the special high-permeability steel forming the magnetic circuit by controlling with a potentiometer-pattern drum-type crank handle-operated controller which conserves the power consumption, increases the magnetic density, and reduces the risk of insulation trouble as is generally met with when controlling highly induced currents. As previously stated, when dealing with moisture-laden sand, sieving is carried out prior to separating, the reverse being the case when the sand is dry.

Pulley Type Separator.

The pulley type of separator (Fig. 2) is designed for use in conjunction with a belt conveyor, in which case the belt-action automatically throws off the extracted magnetic material at the back bottom position, where a receptacle is placed for its reception. When sand is damp, the disadvantage of this type of separator is, that it is impossible to have sufficient magnetic strength to extract small pieces of iron that may be on the top of a layer, and whilst it will extract the larger pieces which in turn carry with it a fair proportion of sand, it will be realised that the majority of small iron such as spillings in the form of small peas will be missed, and this eventually in the process will find its way in the sieved sand and oversize, spoiling the quality of the sand and representing loss of iron.

Where the sand is dry, and the quantity to be dealt with small, the pulley type gives fairly good results. In the majority of cases, the pulley type of separator is used in conjunction with a screen of the jig-shaker type, but as this process is not either from the sieving or separating points of view as efficient as is the case when a rotary-screen and screen-type separator is applied, it is not proposed to enlarge on the subject. It is desirable, however, to point out that these remarks are based on past wide experience and experiments carried out by the firm mentioned above, who make both types of equipments, and incidentally there is very little difference in the cost between one type of apparatus described and the other.

Separating Iron and Brass Swarf.

A very interesting type of separator for separating iron and brass swarf is the standard type illustrated. This removes iron from metal turnings, dust and small non-magnetic substances, and is particularly suitable for treating such as contain a large percentage of iron.

The operation of the machine is simple. After passing through a ¼-in. sieve, the material to be separated is fed into a hopper which can be adjusted to deliver from a few pounds to several hundredweights per hour, according to the require-

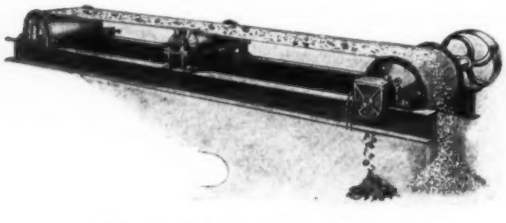


Fig. 2.—Pulley Type Separator.

ments of the material. A feed-tray underneath is jigged sideways, and distributes in a regular and constant stream on to the whole width of a revolving brass drum inside which, radiating from the centre, are specially-designed electro-magnets. These magnets are so constructed that a magnet field is placed across the face of the drum. The magnet element, due to the magnetic influence, is made to gambol from one position to the other, thus freeing itself from the non-magnetic element. From this it will be seen that a clean separation is possible. The electro-magnet unit in this case is stationary, and therefore has a considerable advantage, in so far that the windings are not under any mechanical stresses. On the other hand, the non-magnetic cylinder is made to revolve on suitable bearings, and this latter totally encloses the coils and protects them from mechanical injury. Broadly speaking, the magnetic field extends around the front half of the drum, and iron, when influenced by the magnetism, is attracted to the outside periphery of the cylinder, and by means of the ribs on the drum is carried

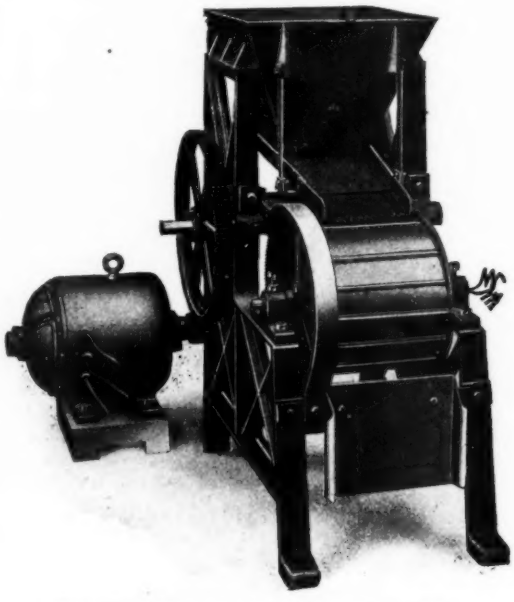


Fig. 3.—Machine for Separating Iron and Brass Magnetically.

round to the back of the machine out of the magnetic field, falling immediately by gravity into a separate receptacle provided for same. It is stated that this separator will successfully separate a mixture of 99 per cent. iron and 1 per cent brass or copper turnings or filings.

It is relevant to note that a sand-handling plant, and a brass and iron separator, is being shown in operation at the International Foundry Trades Exhibition, which opens to-day at the Royal Agricultural Hall.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Refractories in the Foundry.

To the Editor of The Foundry Trade Journal.

Sir,—Reading the above article by Messrs. H. V. Grundy and A. Phillips, under the heading of graphite, we should feel obliged if you would allow us to correct a few of the particulars which have been given by the authors.

Plumbago only comes from the Island of Ceylon, and does not, in its natural state, as your writers state, contain such a high percentage of carbon as 99 per cent. The highest that has been known we believe is 98 per cent. purity, in the large lump form, and it runs as low as 50 per cent. in the flying dust form, hence there is a wider variation from the same locality than the article indicates.

On the other hand, graphite from famous Cumberland mines—which of course do not now produce—ran as high as 99½ per cent. carbon, and it was, in fact, the finest in the world.

There are, of course, many deposits of graphite, but your correspondents seem to have left out the most important origin of material, which is now a serious competitor with Ceylon, viz., Madagascar graphite.

Yours, etc.,
T. S. Wilson & Company.

9 and 10, Great Tower Street, London, E.C.3.
June 4, 1926.

The Metal, Ore & Chemical Company, Limited, have removed to 5, Water Lane, Great Tower Street, London, E.C.3.

The Influence of Prolonged Heating on the Formation of Combined Carbon in Cast Iron.

In his laboratory experiments Piwowarsky has found that the duration of heating has a great influence on the formation of the carbide in cast iron. O. Wedemeyer repeated these investigations on a larger scale (Stahl und Eisen, April 29, 1926, p. 557-60). These experiments were made in the Gutehoffnungshuette, Sterkrade, in a coal-fired reverbatory furnace of 20 to 26 tons capacity. The iron, after being melted, was kept on temperature, checked by thermo-couples, for three hours. The test pieces (always cast under the same conditions) were cubic (130 mm.); the samples for the chemical and metallographic examination were always taken from the same areas of the cubes. The experimental results are given in Table 1, and the changes of the total carbon and the carbide are plotted in the diagrams 1 to 9. The carbon loss does not exceed 0.1 per cent.; the contents of the other components practically remained the same. The combined carbon content of the charges 1 to 7 has considerably increased; the growth of the carbide is clearly seen in the diagram.* The charges 8 and 9 only show a slight increase of carbide. This may come from the fact that the hematite has undergone a very strong overheating already in the blast furnace, and thereby received a tendency to graphitic solidification. The temperature in the reverbatory furnace is not high enough to change the graphite dissolved in the iron as elementary carbon into carbide. The tables show that a transformation of the coarse laminated graphite into a finer condition did not take place. The experiments are to be continued.

TABLE I.

Charge No.	Sample No.	Weight of Charge No.	Material.	Time of Starting.	Sample was taken.	Temperature of the bath.	Total period of melting.	Overheating.	T.C.	C.C.	Gr.	Si.	Mn.	P.	S.
						Deg. C.	Hrs.	Hrs.	%	%	%	%	%	%	%
1	13	26	Roll iron ..	5.30	7.05				2.94	0.82	2.12	0.59	1.08	0.31	0.086
	14				8				2.94	0.96	1.98	0.56			
	15				8.55				2.94	1.00	1.94	0.56			
	16				10	1,270			2.90	1.18	1.72	0.59	1.07	0.31	0.090
							16¾	3							
2	17	17	Roll iron ..	6	6.05	1,350			2.86	1.14	1.72	0.54	1.12	0.30	0.078
	18				7.10				2.81	1.40	1.41	0.52			
	19				8.40	1,370			2.84	1.79	1.05	0.51			
	26				9.20				2.82	1.86	0.96	0.50	1.12	0.30	0.073
							15½	3¼							
3	21	21	Roll iron ..	7	6	1,270			2.88	0.66	2.22	0.66	0.89	0.28	0.090
	22				7.10				2.89	0.72	2.17	0.65			
	23				8.10	1,295			2.89	0.92	1.97	0.65			
	24				9.30				2.84	0.95	1.89	0.61	0.93	0.27	0.097
							14¾	3½							
4	25	14	Roll iron ..	6	6.40				2.82	1.12	1.70	0.46	0.83	0.32	0.085
	26				7.45				2.77	2.43	0.34	0.35			
	27				8.55				2.78	2.61	0.17	0.33			
	28				9.50	1,295			2.77	2.57	0.20	0.32	0.81	0.29	0.086
							16	3¼							
5	30	18	Roll iron ..	8.30	7.30				2.77	0.80	1.97	0.50	0.93	0.32	0.078
	31				8.15				2.79	1.49	1.30	0.48			
	32				9				2.82	2.18	0.64	0.46			
	33				10.5	1,250			2.84	2.53	0.31	0.45	0.92	0.32	0.082
							14	3							
6	49	21	Roll iron ..	6	6.45				2.97	0.83	2.14	0.48	0.83	0.31	0.083
	50				7.25				2.91	1.01	1.90	0.47			
	51				8				2.90	1.05	1.85	0.46			
	52				8.50				2.86	1.61	1.25	0.45			
	53				9.25	1,320			2.80	1.98	0.82	0.43	0.85	0.31	0.083
							16	3							
7	34	17.5	Roll iron ..	8	6.45				2.66	2.28	0.38	0.41	0.86	0.318	0.108
	35				7.20				2.69	2.41	0.28	0.41			
	38				9.10	1,280			2.69	2.51	0.18	0.38	0.84	0.315	0.110
							14	3½							
8	54	25	Hematite ..	4	7.30				3.57	0.81	2.76	1.24	0.56	0.114	0.057
	56				8.30				3.54	0.82	2.72	1.23			
	58				9.30				3.63	0.97	2.66	1.23			
	60				10.15	1,290			3.66	1.00	2.66	1.23	0.59	0.114	0.060
							18½	3							
9	61	11	Hematite ..	10	6.10	1,270			3.83	0.89	2.94	1.72	0.74	0.093	0.046
	64				7.55				3.68	0.83	2.85	1.65			
	66				8.50				3.76	0.96	2.80	1.64			
	67				9				3.68	1.03	2.65	1.62	0.74	0.092	0.046
							11½	3½							

* See next page.

Heat-Resisting Nickel Chrome Alloys.

By C. H. S. T.

Up to four years or so ago it was considered well nigh impossible to subject an alloy plate or tube to a temperature of 1,145 deg. C. continuously without any deterioration such as scaling, grain growth or warping. Research in the nickel-chrome alloy group has, however, shown that several combinations of these two elements can be effected which will withstand the most arduous conditions of industrial service. One of these nickel-chrome alloys has been produced on a commercial scale which is heat-resisting under ordinary furnace conditions at an oxidising or reducing temperature of 1,145 deg. C. for 10,000

hours continuous heating or 4,000 hours of intermittent heating. This alloy can be varied in composition so as to produce either malleability for forging and rolling or machining, or compounded so as to obtain great stiffness and non-warping qualities. Such an alloy is used for carbonising boxes, enamelling racks, retorts for purposes where alkalis are not encountered, hearth plates, skid rails and furnace conveyor parts. The physical properties of this alloy are: Tensile strength, forged 44 tons, cast 22 tons; elongation in 2 in., forged 25 per cent., cast, 0.15 per cent.; weight per cub. ft., forged, 490 lb., cast 480 lb.; Brinell hardness, 170 to 300; pattern maker's shrinkage, $\frac{1}{4}$ in. per ft.; expansion between 0-1,090 deg. C., $\frac{1}{8}$-in. per ft.; coefficient of expansion 0-1,090 deg. C., 0.00027 per cent. per deg. C.; heat conductivity, 1/40 that of copper.

Another form of nickel chrome alloy has been produced for use at temperatures up to 980 deg. C. This alloy is not recommended for higher heats, and its usefulness is limited by its hardness and rigidity, which can only be modified at the expense of its strength. This alloy is almost non-machinable, and it is used largely for such purposes as supports for oil cracking stills and furnace skid rails.

An alkali-proof alloy of the same metals has also been developed during the past year, which embodies as well the highest possible heat resistance of any chrome-nickel or chrome-iron-nickel alloy. Contrary to the belief that nickel-chrome-iron alloys are not resistant to the action of alkali compounds, either caustic, carbonate, silicate or cyanide, it has been found that within a certain narrow range an alloy of these three metals is practically immune from alkali influence, and also that a particular composition carries with it the very highest degree of heat resistance of any of the possible combinations of the three metals.

Retorts weighing 16,000 lb. to carry a load of 10,000 lb. on a 20-ft. span, for operation at 1,145 deg. C., and to handle a half molten soda mixture have been made of this alloy. In its soft malleable form it has a tensile strength of 135,000 lb. with 35 per cent elongation.

A fourth nickel chrome alloy is now being used for temperatures between 895 and 980 deg. C.: it will also endure 1,090 deg. C. for short periods. This alloy is chiefly used for carbonising boxes. It has been claimed for nickel-chrome-iron alloys used for carbonising boxes that they are non-warping, non-scaling, non-cracking and non-carbonising. The fact is that all alloys of this character absorb carbon, but to a lesser extent than steel. In this connection carbonising boxes which have been in use for some thousands of hours, and the average of a number of tests on such boxes shows that if the alloy originally contained 0.8 per cent. carbon, 1/16 in. on the inside of the box has been found to contain 2½ per cent. carbon; the next 1/16-in., 2 per cent.; the next, 1¾ per cent.; the next 1½ per cent.; and in a box with a ⅜-in. wall an increased carbon content has been traced as far out as ¼-in., leaving only the last ⅛-in. containing the original amount of carbon. If the original alloy is given a higher carbon content this absorption of carbon is slower, but on the other hand a high carbon alloy is more easily subject to cracking under sudden temperature changes or uneven heating and cooling, and its use is therefore not advisable.

Alloys resistant to 50 per cent. sulphuric acid under pressure have also been made of nickel and chrome, and the writer has details of a pot weighing 4,000 lb. and a capacity of 150 cub. ft., which is used for boiling this acid. This pot is estimated to lose about 6 grams of its weight with every charge of 24 hours' duration. Similarly combinations of the same two metals have been made to resist nitric acid, though it is attacked by hydrochloric and sulphuric acids.

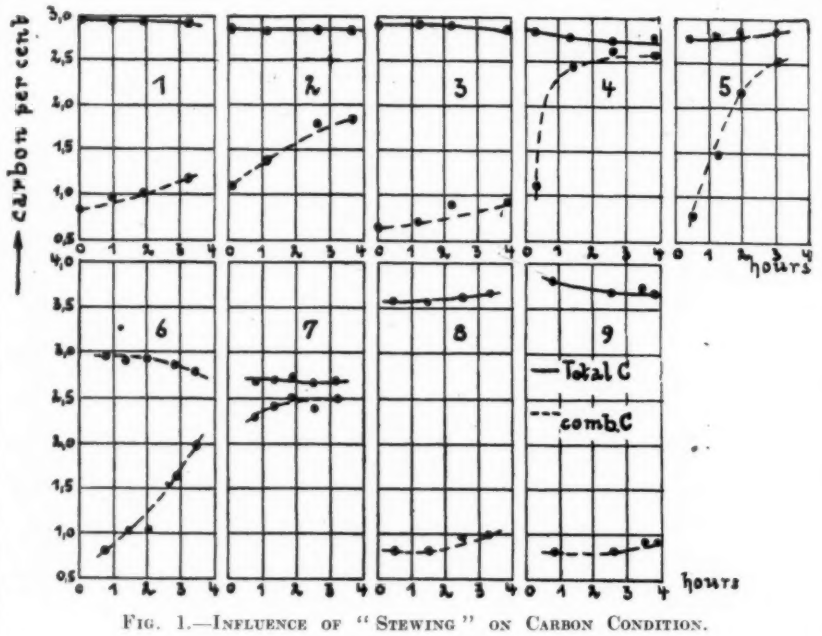


FIG. 1.—INFLUENCE OF "STEWING" ON CARBON CONDITION.

Cleaning Delicate Castings.—When cleaning small, delicate castings in the tumbler, it is profitable to throw into it blocks of wood and old leather belting cut into squares. Any danger of breakage is then entirely eliminated, besides giving much better results in the general finish of the castings.

Mixture for Spur Wheels.—For cast-iron spur wheels of ordinary proportion use Cleveland No. 3, 52 per cent.; Lincoln No. 3, 40 per cent.; Scotch No. 3, 8 per cent. Some foundries use more Scotch and less Cleveland, but varying cupola conditions can easily account for this slight difference.

A Reliable Solution for Preserving Cast Iron.—Under average conditions, the following mixture will be found to be useful for preserving cast iron:—Mix 100 lbs. of dry lamp-black with benzine to the consistency of ordinary paste. Next make the following mixture:—Lamp-black paste, 5 gallons; turpentine japan, 2½ gallons; boiled oil, 1 gallon; and ordinary varnish, 1½ gallons (the cheapest obtainable is quite suitable). For really first-class work it is advisable to add to the above about 12½ lbs. of refined lamp-black (ground in japan). Dilute the resulting mixture with sufficient turpentine that will make it as thin as water. Clean the castings thoroughly before dipping into the above, as sand or grit destroys the life of both the mixture and its resultant preservative qualities.

International Foundry and Allied Trades' Exhibition.

Description of Exhibits.

This Exhibition, which opens to-day at the Royal Agricultural Hall, Islington, marks a definite advance in foundry equipment since the last show held some two years ago. Every moulding machine manufacturer has brought out new models, whilst there are at least four new entrants into this field. The conveying of moulds, sand and castings is at last receiving attention, and several firms are seriously turning their attention to the solution of this problem. The exhibits pertaining to this should command the attention of every visitor. The reclaiming of magnetisable metals from sand and brass swarf is being demonstrated for the first time at any British foundry exhibition. Scientific apparatus is even better represented than usual, and a large selection of pyrometers and microscopes are on show.

The raw materials of the foundry trade are represented by numerous exhibits of pig-iron, coke, sands and refractory materials.

Finally, there has been arranged the most comprehensive exhibition of a non-commercial character ever staged in any British foundry exhibition. It is designed to show something of the progress which has been achieved: the scientific aspect of its raw materials; research in progress for its advancement and a selection of the scientists' apparatus. National and trade research organisations, the modern universities and British and foreign technical societies have all contributed their quota. Every visitor should make a special effort to spend some portion of his time examining these exhibits.

MESSRS. W. T. NICHOLSON & CLIPPER, LIMITED,

"Clipper" Works, King Street, Salford, Manchester.

This firm's principal exhibit is the improved "Klincha" belt-lacing machine, which embodies many improvements, and the outstanding features of which are as follows:—Detachable magazine facilitating the insertion of the hooks into the machine when making this joint, and improvements enabling the machine to be operated with one hand, leaving the other free to hold the belt in the correct position while the joint is being made. The improved "Klincha" belt fasteners are now mounted on an outside paper strip, and built up in 12-in. lengths, preventing any lateral displacements, and making it easier and quicker to place the fasteners in the machine. The fasteners can be readily cut to any length required without disturbing the hooks. It is not necessary to take off the strips to insert the belting between the hooks, which are held in correct position and spacing independent to the slots of the machine, and thus no time is wasted in straightening out displaced hooks, as occurs with other carded types. Joints made with the "Klincha" system are flexible, detachable, interchangeable, smooth running, and will run round the smallest pulleys without knock or jump. No skill is necessary, or stoppage of machinery involved. No wastage of time and material, and no projections; consequently, no danger to workmen.

Other exhibits are (1) the improved "Klincha" vice tool, which is a 4-in. machine, intended for use on an ordinary vice, specially suited to small users of belting.

(2) The well-known 3-, 4- and 6-in. "Klincha" mallet tools, which are now made for use with the improved type of fastener.

(3) The "Python" file and tool handle, which has a steel coil spring pressed into the centre, which is secured in its place by a specially designed ferrule. These two together take up all the pressure when the file is driven into the handle. The ferrule cannot be removed without destroying the handle. The handle grips the file tang much firmer than the ordinary handle, because the wood is compressed within the coil spring when the file is driven in.

(4) Improved "Klincha" belt cutter, which can be operated with very little effort, and leaves one hand free to hold the belt in correct position. Cuts and squares the belt with perfect accuracy, thus obviating any uneven strain on belt when running. The knife arm lifts up to allow the belt to be put in place without being threaded under the knife. A safety-guard covering the blade, makes it impossible to cut hands or nick belts. The knife can be dropped from upright position with man's fingers on knife bed without cutting, as the cutter does not operate until the power is applied by lever.

(5) The "Klincha" belt-cutting shears. One of the cutting blades of this tool is furnished with saw teeth inclined towards the handle. These teeth hold the material fast and prevent its slipping towards the point of the shears. Leather, balata, and woven belting, sheet rubber washers, strips, and soft packing materials can be readily cut with square or inclined edges by this method.

J. B. CORRIE & CO., LIMITED,

15, *Victoria Street, Westminster, London, S.W.1.*

Amongst the machines which this firm are exhibiting are four types of hydraulic moulding machines, A.B.H.R.1, A.B.H.R.0, A.B.H.1, and A.B.H.2 The first two are of the reversible table type, and the second pair of the fixed table type. These are supplemented by a hand-moulding machine (type A.B.2).

In the hydraulic moulding machines, the ram is situated underneath the table, and is operated by a hydraulic distributing valve with a three-way control. The valve is of very simple and robust construction, and fool proof. They are being shown in operation, and moulds will be made of the British standard axlebox, negro pots, etc.

A semi-automatic sand plant, which is being shown is an invaluable asset to any foundry using moulding machines, the resultant sand therefrom being of an extremely fine character, and being used in a relatively dry condition, it ensures the sand flowing around the pattern, reducing hand-ramming to a minimum, and at the same time ensures the production of satisfactory moulds. These sand plants are made in various sizes up to 40 cubic metres per hour, and the plant shown is a one pan mill with a capacity of about 4 tons per hour.

All the above are being shown for the first time in Great Britain. The stand will be in charge of Mr. Guy Corrie, Mr. J. B. Corrie, and Monsieur Baillot. These machines are manufactured in the works of Messrs. Alfred Baillot & Company, Paris.

The following agencies have been established:—

India.—Thos. Robinson & Son (India), Limited, 24, Park Street, Calcutta.

Argentina.—Anderson Levanti & Company, Alsina 471, Buenos Aires.

Brazil.—M. Almeida & Company, Caixa Postal 457, San Paulo.

T. J. PRIESTMAN,

Cupro Foundry, Leopold Street, Birmingham.

This exhibit is of special interest to non-ferrous foundrymen. Conditions are such in this industry that it is often desirable and economic to buy alloy for re-melting, even though the foundry is quite capable of controlling chemically its output. It is merely a question of large-scale operation. Mr. Priestman is showing a full range of aluminium alloys for sand and die castings, crank case, piston, and aircraft alloys, aluminium billets and sticks (for steel foundries), and aluminium bronzes.

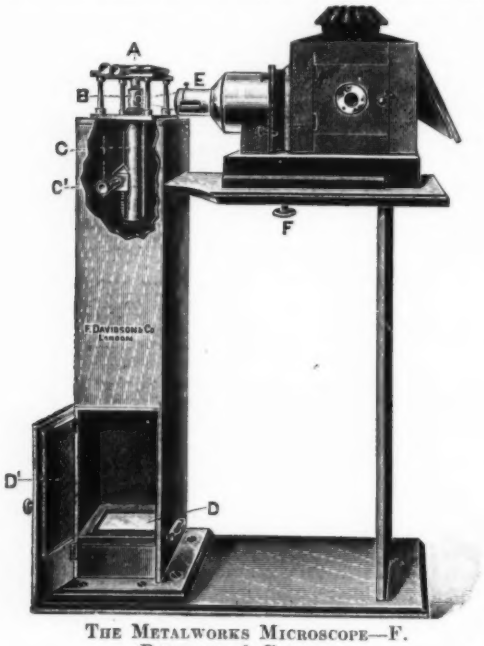
For the heavier non-ferrous foundries there are brass, gun-metal, white-metal, phosphor-bronze, and nickel-silver ingots. For the electro-metallurgist there are copper, nickel, brass, and zinc anodes. Another exhibit is brass billets for both forging and extension.

The stand will be in charge of Mr. Alfred Evans.

F. DAVIDSON & COMPANY,

29, *Great Portland Street, London, W.1.*

The exhibits of this firm are in charge of Mr. J. D. Jacobs, who will demonstrate the various metallographic apparatus in which they specialise. The well-known Davon Super Metalab microscope



THE METALWORKS MICROSCOPE—F. DAVIDSON & COMPANY.

is the principal exhibit. It is capable of a 4,000 diameter magnification. For routine work the "Davon Metalworks" is of extreme importance, as it is capable of giving 100 microphotographs at 100 diameters per hour.

A recent development of the "Metalworks" camera has been made by Dr. Rogers. This consists of adapting it for either one, two or three magnifications, *i.e.*, either x100, 250 or 500 or x100 and 250 or x100, 250 and 500. This has been done without a very material increase in cost being entailed. The production of such an appliance for critical work at a moderate price is a credit to the designer and the manufacturers, and one of its most valuable features is that a layman can be taught to use it effectively in half an hour. A comprehensive collection of photographs and transparencies at magnifications of from x25 to x5,000 will be on view.

BOWEN INSTRUMENT COMPANY,

9, *Newton Road, Leeds.*

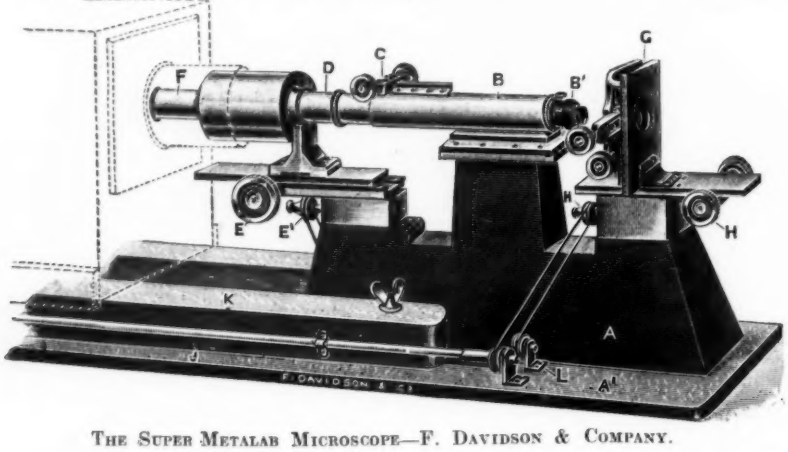
The apparatus being shown by this company includes pyrometers of thermo-electric, electric resistance, radiation, and optical types, and rheostats for control of electric currents.

The "Pyro" insertion pyrometer which is being shown is essentially designed as a workshop instrument in aluminium and non-ferrous foundries, in which there has been a crying demand for a rapidly operating instrument for temperature measurement.

Accuracy of temperature control is of increasing importance in foundries, but hitherto the temperature measurement of molten metals has been a problem of the greatest difficulty for several reasons. Owing to the formation of surface dross on the molten metal, the application of a distance pyrometer (*i.e.*, of either radiation or optical type) results in errors of considerable magnitude, the extent of such errors depending on the nature of the metal and on the physical conditions of temperature measurement. Moreover, the use of the thermoelectric pyrometer has hitherto been largely confined to experimental or special occasions, due to the protection of the thermocouple wires (or stem) by an outer sheath of expensive material such as quartz, porcelain, etc. Even the best protecting sheath very soon succumbs to the active chemical action of molten metals, unless constructed with thick walls, consequently accompanied by considerable "time lag" or "temperature lag" or both. Therefore, since speed and accuracy of reading are both essential in this class of work, a thermoelectric pyrometer protected by an outer sheath as described has no welcome reception in the foundry.

In the "Pyro" foundry pyrometer the thermocouple (or stem), the indicator, and the connecting cable are built up in one self-contained, compact, and portable unit, with handle attached. The whole pyrometer can thus be readily carried and operated in one hand.

In spite of the fact that the "Pyro" radiation pyrometer, which is also being shown, was placed on the market only recently, its reception has been so favourable that it is now commanding one of the foremost reputations in the field of pyrometry. It operates upon the well-known principle of radiation. It is used at a distance away from the furnace, and hence it does not suffer from deterioration by the action of furnace gases. Its parts operate thermo-electrically, and hence the instrument is self-contained, requiring no accessories of any kind. The operator is not required to perform any complicated measurements or comparisons, so that



THE SUPER METALAB MICROSCOPE—F. DAVIDSON & COMPANY.

the readings obtained are quite independent of "personal error" and are automatically accurate. Temperatures are measured instantly by simply pointing "pyro" at the hot body to be measured, and pressing a stud.

Another interesting exhibit is the Bowen thermo-electric pyrometer for white metals, which is fitted in a single unit. This instrument really comprises three distinct sections, which are termed respectively the "stem," the "indicator" and the connecting "cable." The insertion of the tip of the "stem" in the molten metal sets up an electric current in the pyrometer, proportionate to the temperature of the casting metal; and this electric current moves the pointer to register the correct temperature. The apparatus is self-complete and does not require an external source of electric current. A similar type is available for non-ferrous work, reading up to 1,100 deg. C.

For iron and steel foundries, the "Wanner-Simplex" will be found to be interesting, as it has a range of temperature reading between 840 and 2,000 deg. C. This type possesses a distinct and important advantage over other types of optical pyrometers, for its temperature scale is not derived from empirical methods of calibration, but is based upon exact physical laws which are universally known and accepted.

When applied to muffle furnaces, open-hearth furnaces, puddling furnaces, and other closed furnaces, the "Pyro" radiation pyrometer is eminently suitable, whilst for ladles or pouring streams of iron and steel, its use is fully recognised; for in these cases, there is a loss of radiant energy which affects the accuracy of all "total radiation" pyrometers and also of empirical forms of so-called optical pyrometers to a greater or lesser degree. This loss, however, affects the "Wanner" pyrometer only in very slight degree, particularly when the instrument is applied to clear spots on the molten metal surface.

For the control of core stoves and drying ovens, the Polymeter is shown.

A "coil" of platinum wire changes in its resistance according to the temperature to which it is subjected. The fittings are so designed as effectively to protect the coil from damage of any kind, and at the same time to allow quick response to the surrounding temperature. Instead of the usual accumulator, a small dry battery (such as a "flash-light" battery) may be utilised to provide the working current, except in the case of large multiple equipments requiring frequent measurements.

For multiple equipments, further improvements have been incorporated in the "Polymeter." This instrument combines the indicator multiple switch (up to 10 stations), and front cable terminals in one complete unit, with resultant economy in space, and in costs of erection and upkeep, together with greater simplicity in operation.

Where permanent records of temperature are desired, the indicator may be replaced with a suitable recorder; and clients are invited to consult the makers for full descriptions of recording equipments.

Signalling pyrometers are also shown, provided with maximum and minimum contacts actuating a relay device for lighting signalling lamps when temperature of furnace or stove departs from desired reading. Improved neat equipment, giving no trouble in usage. This, and a new type of recording pyrometer, have never previously been shown. Mr. R. Gates is in charge of the stand.

THE DENBIGH ENGINEERING COMPANY, LIMITED

Horseley Heath, Tipton, Staffs.

The whole of the machines shown have various important improvements embodied in them as compared with the last Exhibition. The larger types of machines of both straight-draw and turn-over types are to be shown, but details are not yet available. Mr. S. Tomkins will be in charge of the stand. It is interesting to note that the manufacturers of these machines are machine tool makers, and are therefore in an excellent position for producing really high-grade plant. The manufacturing plant is available for inspection, and at all times for all interested to see the machines working in their own foundry. The firm invite inquiries respecting foreign agencies.

THE FORDATH ENGINEERING COMPANY, LIMITED

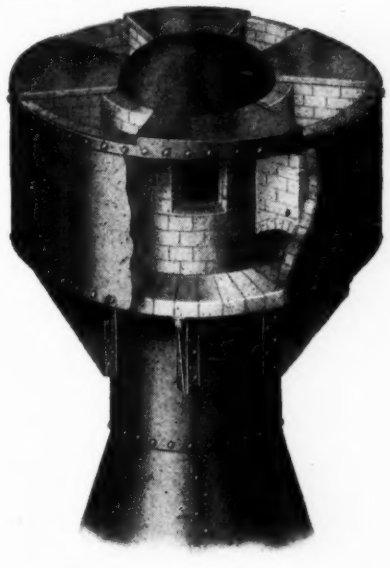
Hamblet Works, West Bromwich.

The well-known firm of core oil compound (Glyso) manufacturers have recently extended their business to include a number of further specialities. Their exhibit includes cores made from "Glyso," cores in process of manufacture, a new "Fordath" mixer with entirely novel devices for mixing and emptying, rotory core-making machines, sands, special pig-irons, refractory material for cupola lining, etc., and types of "Glyso" core oils originated by this firm. The following are expected to be available for the answering of inquiries: Major J. W. Athey, Mr. T. C. Carlin, Mr. A. H. Newsum, Mr. W. Roxburgh and Mr. W. M. Wilson. Agents have now been appointed in India, Australia, New Zealand, U.S.A., Brazil, Holland and Belgium. Agencies are required in other countries.

PNEULEC MACHINE COMPANY, LIMITED,

Mafeking Road, Smethwick, near Birmingham.

In addition to exhibiting a selection of their already well-known foundry equipment, the Pneulec Company are this year showing some products of their new line of manufactures. On their stand No. 2, Row E, is shown the bottom section of a Pneulec 3-ft. 6-in. diameter standard windbelt-type cupola, a 20-cwt. geared crane-ladle and a 10-cwt. geared crane ladle. There is also a sectional model of the "B" type special spark arrester, which is of distinctly new and original design. It will be remembered that this concern purchased the whole of the constructional plant of Messrs. Thwaites Brothers, Limited, Bradford, the well-known cupola makers, which was specially designed and laid out for the manufacture of cupolas, ladles, stagings, etc. The electrically-operated jar ram machine is one of the better known of the moulding machines produced by this company. The outstanding feature of this machine lies in the fact that it is a power jar ram, and is a unit complete in itself. No compressed air plant is required for its working. The 5 h.p. electric motor with which the machine is fitted supplies the necessary power. It is a very simple machine to operate, as two handles control all the operations. The adjustment of the jar on this machine is particularly fine.



A NEW TYPE OF SPARK ARRESTER—PNEULEC MACHINE COMPANY.

Of their range of hand moulding machines, the P.H.-type hand ram machine is exhibited. This machine is of very substantial construction. Due to the large size diameter cylinder in the machine, a steady pattern draw is ensured. In addition to the above, there will also be found an oilsand mixer. This is of the paddle type, and makes the efficient mixing of oilsand quite a simple matter. Altogether this is a very interesting exhibit, and the products shown are well representative of a big line of manufactures which includes "almost any piece of foundry equipment, from a moulding box to a complete melting plant." On Stand No. 3, Row E, are shown photographs of recent Pneulec layouts, and foundrymen will find these of interest.

Messrs. S. E. Smith, B. Lines, W. Warmington and F. I. Spinks are in charge of the exhibits.

Their manufacturing plant is available for inspection during the run of the Exhibition, and the proprietors will be pleased for founders to see the facilities available.

BRITISH PIG-IRONS, LIMITED,

Abbey House, 2, Victoria Street, Westminster, London, S.W.1.

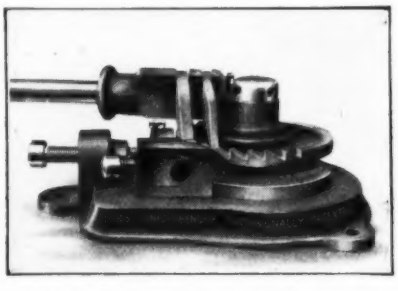
This firm are showing typical exhibits of "Midhill" and "Glenhill" allmine special pig-irons, fractures, test pieces, etc. These brands are smelted by their associated company, the

Midland Coal, Coke & Iron Company, Limited, Newcastle, Staffs., whose plant is conveniently situated to the largest Midland engineering works, and is in close proximity to the Mersey ports for prompt shipment to all parts of the world. These brands are produced in cylinder, cold blast and special foundry qualities, and are appreciated in numerous foundries of importance throughout the engineering world where superior castings are made. The firm is in a position to meet any practical specification, and the accuracy of consignments is assured by means of dual laboratory control. Since the inception of the firm it has been their object to supply iron to any desired specification. The stand is in charge of Messrs. G. B. Taverner, W. H. Prior (Manager, Foreign Department), I. H. Baker (Midlands representative) and G. Bachelard (French representative). Resident agents have been appointed throughout the world.

MAJOR, ROBINSON & COMPANY, LIMITED,

"Scols" Works, Sykes Street, Chester Road, Manchester.

This well-known firm are the manufacturers of "Scols" iron and steel cements and other specialities, which are in use throughout the engineering and allied industries. Their principal exhibit, however, is the "Scols" Junior tube bending machine. This tool has been specially designed for bending light gauge tubes up to 1 in. bore, 20's gauge, in copper, brass, steel and aluminium, without filling, loading or annealing. This, combined with speed and accuracy in bending, makes it one of the most valuable tools in the equipment of any firm who undertake this class of work. The machine is portable and can be taken to a job, the approximate weight being 64 lbs. complete with three standard formers; it is easily fixed, and skilled labour is unnecessary. The bender does all its work in full view of the operator; any degree of angle can be obtained up to a U bend, also any offset with a minimum throw according to the size of tube being bent. The stand is in charge of Mr. McManus.



"SCOLS" TUBE BENDING MACHINE—MAJOR, ROBINSON & COMPANY.

BRADLEY & FOSTER, LTD.,

Darlaston.

On this stand are samples of pig-iron as supplied for a variety of special purposes. A complete range of fractures of refined malleable pig-iron are shown, together with fractured test pieces and numerous malleable castings, some of which are bent and twisted to show the tests of which the iron is capable.

Several grades of cylinder pig-iron are on view, with fractures, and a number of good examples of water and air-cooled motor cylinder blocks by well-known firms. A special point is made of low total-carbon and low phosphorus, and the fractures are definitely close grained.

In addition, there are samples of cold-blast and special pig-irons for chilled castings, acid resisting, heat resisting, locomotive cylinders, and numerous other purposes.

Numerous micro-photographs, some showing pearlitic structure, are on view, and records of tensile, elongation, scleroscopic, and other hardness tests. Typical analyses of all the irons are also shown.

Most of the pig-iron exhibited is supplied to a definite chemical composition, and the makers undertake customers' requirements to a guaranteed analysis.

A feature of this stand is that a number of the castings exhibited bear show cards with the names of the actual makers. Many of these are extremely good and interesting examples of the art of iron-founding. Incidentally, it may be presumed that all these firms are regular users of Bradleys' pig-iron, and apparently with satisfactory results.

The stand, which is in charge of Mr. G. B. Richards, is tastefully designed and the exhibits well arranged, and the whole is a good example of what can be done in the way of advertising, even with such a subject as pig-iron.

This firm is represented on the Continent of Europe by Mr. J. H. Fleming, of 14, Rue Van Orley, Brussels.

BROOM & WADE, LIMITED,

High Wycombe.

This well-known firm of air compressor manufacturers are showing three "Broomwade" standard type, vertical, single stage air compressors, having respectively 1, 2 and 3 cylinders, and delivering 25, 200, and 450 cub. ft. of air per min.

Additionally there is a 2-cylinder 7 in. × 8 in. "Broomwade" compressor, direct-coupled to an electric motor, mounted on a combined bedplate, and having an actual output of 130 cub. ft. of free air per minute at 100 lbs. per sq. in. pressure.

There is also being shown a steam-driven "Broomwade" compressor, having two air cylinders each 10 in. dia × 12 in. stroke, and one steam cylinder 10 in. dia. × 12 in. stroke. The actual output is 300 cub. ft. of free air per minute, at pressures up to 100 lbs. per sq. in.

"Broomwade" standard design machines are exceptionally suitable for installation in foundries, being of compact dimensions, totally enclosed and dustproof, all working parts being readily accessible, the system of forced lubrication being positive and foolproof. They require a minimum of attention, and a minimum of input power for a given output at a given pressure.

A portable petrol-engine driven, self-contained air compressor plant is an outstanding exhibit, embodying one 2-cylinder 6 in. × 6 in. air compressor, direct coupled by means of patent centrifugal clutch to an Aster 4-cylinder petrol-engine plant which runs at 600 r.p.m. and has an actual output of 100 cub. ft. of free air per minute at 100 lbs. per sq. in. pressure. The chassis is mounted on sprung axles with rubber tyred wheels, and the plant is complete with substantial steel housing with detachable sides.

A "Broomwade" standard design single-cylinder 6 in. × 7 in. vertical compressor, with mechanically operated valve gear, in section will also be shown in motion.

A collection of "Broomwade-Goliath" pneumatic tools of the following types, suitable for foundry work, is being shown, chipping hammers, pick, sand rammers, grinder, brush, and drills.

The exhibit is in charge of the Managing Director, Mr. H. S. Broom, who extends an invitation to visitors to inspect the works. The foreign agencies of this concern are of the most complete character.

THE GENERAL REFRACTORIES COMPANY, LIMITED,

28, *Blonk Street, Sheffield.*

This stand contains an interesting collection of refractory materials of all classes, qualities, shapes, forms and colours, most of the loose material being displayed in an attractive form. High-grade firebricks, formed of magnesite, chromite, silliminite, silica and fireclay, are shown side by side, with the non-slagging "Coroma" brick, which is a principal speciality of this firm. "Yorkshire sand" and Bramcote sand are two other specialities so well known as to be almost household words in the foundry industry. Sands to suit all tastes and every class of work are here to be seen and handled, and amongst others, which few moulders will have difficulty in recognising, are the following:—

The celebrated "Red Rover" grade of sand from Mansfield; "York Yellow"; Warsop sand; yellow and white silica sand from South Cave, the Heck and Hensall sand produced by the Yorkshire Amalgamated Products, Limited, and the yellow

sand of Pickering (for which this firm are the sole sales agents), and the well-known and justly esteemed "Maximum" and "Minimum" core sands, the former of maximum effective grain size and the latter a fine sand for small work, all find a space on this stand. Core binders are also exhibited in the form of Kor-Glu (liquid) and K.B. core binder, which is in the form of fine flour.

Other exhibits are "Plasstick," "Gallas Ganister" (another speciality) and Sheffield ground ganister, which are seen together with a lump of the original grey ganister rock from which these materials are prepared. Silica cement, silica paint, silica flour, lump and gravel fluor spar, fluor spar flour and "Pyrolite," a refractory cement which sets hard with water like Portland cement; steel moulder's compo; "Compito"; magnesite cement; crucible ganister; crucible pot-making clays, etc., combine, with interesting announcements, attractive placards and booklets, to provide a stand which will be full of interest to every foundryman.

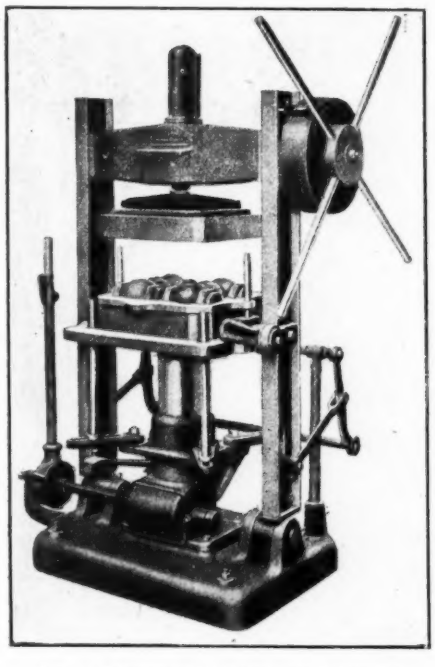
The stand will be in charge of Mr. Frank Russell, Mr. George Senior and Mr. A. C. Turner. Branch offices have been established in Scotland, Middlesbrough, Birmingham, Lancashire, Leeds, Derby, Hull, Newcastle and London.

BRITANNIA FOUNDRY COMPANY, LIMITED,

Cox Street, Coventry.

Moulding machines of great variety and capacity comprise the major portion of the exhibits of this well-known British foundry concern. Amongst other machines they are showing a "Britannia" jar-ram moulding machine, driven by compressed air. It has a self-contained lifting apparatus of unique construction, consisting of an annular piston guided inside and out on the whole of its area, ensuring a definitely vertical and accurate lift calculated to withstand long and hard wear. No. 0 rams moulds up to 5 cwts., whilst Nos. 1 and 2 take up to 10 cwts.

The "Coventry" is another popular type of machine shown on this stand. In this machine —a turn-over jar-rammer—the mould is lowered from the turn-over table by a central piston, work-



THE "COVENTRY" MOULDING MACHINE.
BRITANNIA FOUNDRY COMPANY.

ing inside the jarring piston, and is therefore perfectly true and cannot get out of line. The pattern-drawing piston, being operated by oil through pneumatic pressure, gives a perfect draw, thus castings of absolute uniformity are obtained. The moulds are withdrawn by means of a ball-bearing trolley on extension lines. The turn-over table is cranked to help balance when being turned over, whilst steel castings are used for turn-over table, pattern-drawing table and piston, jolting table, and side-column brackets.

The "Coventry" pneumatic jolt squeeze moulding machine, which is also shown, has been designed for making castings that are adaptable to this method of machine moulding, and is very quick in operation. The jolting, squeezing and lifting operations are worked by compressed air, thus relieving the operator of any undue strain. The valve for the jolting is operated by the knee, and the stripping cylinders are controlled by a single lever, which also starts the pneumatic vibrator.

The pattern-stripping arrangement is operated by oil from pneumatic pressure, thus ensuring a perfectly steady draw. The cylinder for operating the pattern-stripping arrangement is central with the squeezing and jolting cylinder, thus close accuracy is obtained. A pressure gauge is fitted to enable the operator to get the exact pressure required on the mould.

For those interested in intricate castings, the "Coventry" head-rammed moulding machine will appeal. It has a great depth of ram and height of lift, and represents a power machine without power, because of the mechanical geared head, which enables a man, without undue exertion, to ram any mould as hard as it is required. The

THE "ADJUSTABLE" MOULDING MACHINE.
BRITANNIA FOUNDRY COMPANY.

ram works with a squeezing motion, and the operator can easily gauge the amount of pressure.

The "Adjustable" moulding machine, which is also on show, is of the simplest nature, there being nothing to get out of order. Since the last exhibition it has been entirely re-modelled, and is of robust construction. It now consists of a single pedestal, on which are mounted four radially movable arms. Upon these arms are sliding stools which carry the moulding boxes, and can be quickly moved to take any size box from 10 in. to 30 in. wide, length unlimited, and locked in any position by ordinary nuts. This is a very rigid arrangement. The pattern plates can be fixed on to resistance boxes, sliding arms, or directly on to the table, in the centre of which is a strong plunger, which supports the plate in a proper manner and takes all the pressure of the ramming. The plunger is operated from below with a crank and central-thrust connecting rod, which enables the pattern to be withdrawn from the mould in a perfectly true, smooth, and accurate manner. All the working parts are accurately machined, and, being enclosed, are entirely protected from any evil effects of the foundry sand.

Two exhibits other than moulding machines are being shown. One is the "Duplex" foundry sand mixer. This machine has two vertical spindles running in opposite directions, one within the other, which are driven by bevel gearing from the horizontal shaft. These spindles carry intermoving cages of steel studs, each ring of which passes its next ring at high speed in opposite directions, and so do the mixing and disintegrating. The hopper on top of the machine feeds the unmixed sand into centre cages, and the domed shaped cover directs the mixed sand to the

floor. The machine will deal with all one man can shovel, viz., about 5 tons per hour.

The other exhibit is an improved gas-fired core oven, made of sheet steel, packed with silicate cotton (an excellent non-conductor of heat). Thus half the gas can be turned off when the required heat is reached and the temperature still maintained.

Mr. D. W. Lennox, the managing director, and Mr. C. Scampton, director and general manager, are personally taking charge of the stand. The Britannia Foundry is open for inspection during the run of the Exhibition. The firm have established agencies in India, Burmah, Ceylon, Japan, New Zealand and Australia, and other countries in the Far East.

FOSTER INSTRUMENT COMPANY,

Letchworth, Herts.

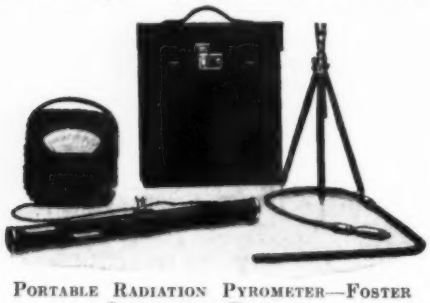
The Foster Instrument Company, of Letchworth, Herts., exhibit samples of their industrial pyrometers. This firm has devoted much time and enterprise to the development of these instruments, which has resulted in a complete line of robust, simple pyrometers, capable of accurate performance even in the severe conditions existing in a foundry.

Optical Pyrometer.—The optical pyrometer has long been recognised as the most convenient means of measuring temperatures of molten iron or steel. The Foster Optical is of the disappearing filament

OPTICAL PYROMETER—FOSTER INSTRUMENT COMPANY.

type, and incorporates a patented lamp bridge unit, which enables the whole scale on the indicator to be usefully employed. The instrument is direct reading in temperature, and is particularly convenient in use.

Fixed Focus Radiation Pyrometer.—An instrument of the "total radiation" type, which does not require focussing in use. The receiving tube is provided with ventilation openings to deflect any fumes which might enter the mouth of the tube when near a furnace. A convenient sighting device is incorporated, by means of which the user

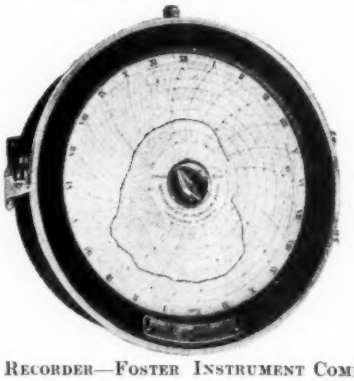


PORTABLE RADIATION PYROMETER—FOSTER INSTRUMENT COMPANY.

can verify that the cone of vision is filled, and subject to this, the instrument is entirely independent of distance and size of hot body. A window, which is removable for cleaning, protects the sensitive parts from dust. A simple portable outfit is shown, also an "Inspector's Outfit," which combines a thermo-couple for reading lower temperatures on the same indicator.

Dial Recorder.—In producing their new Dial Recorder the Foster Instrument Company have made possible the wider use of recorders in industry, where hitherto cost has been a serious obstacle. The instrument is extremely simple and robust, and of a very high order of accuracy. The particular construction affords complete protection of all working parts, which normally are never exposed, and cannot suffer damage when the chart is being changed. The record is made through a carbon paper on to the back of a translucent chart, and the whole record is visible at any time without disturbing the instrument. The case is of cast iron, the instrument is therefore magnetically shielded and is not affected by adjacent cables carrying heavy currents.

Direct Immersion Pyrometer.—The Foster direct immersion pyrometer provides the most convenient means of measuring the temperatures of molten non-ferrous metals. Base metal thermo-couples are used, thus the upkeep cost is low. The indicator is usually of the portable pattern, being light and convenient to handle. Readings are obtained in about 30 seconds.



DIAL RECORDER—FOSTER INSTRUMENT COMPANY.

Strip Recorder.—This instrument is supplied for use with either rare or base metal thermo-couples, and is made for single records, or for two, three or four records on one chart. The automatic commutator, used for producing multiple records, is easily accessible for cleaning of contacts in position. The instrument is contained in a cast-iron case.

Ink Recorder.—This recorder employs a circular, or dial, chart. The record is in ink, on a stout paper chart, both the record and the chart divisions being indelible. A patented inking device prevents clogging of the pen or loss of record in hot positions.

Power Plant Pyrometer.—This is of the thermo-couple type, with concentric thermo-couple designed to follow temperature changes very closely. Specially suitable for measurement of temperatures of superheated steam, exhaust gases, etc.

Complete pyrometer outfits are shown in various forms, including a low temperature indicating outfit such as is supplied for application to core-drying stoves. All instruments incorporate the "Resilia" patent moving coil system, a large model of which is exhibited.

The Institute of British Foundrymen is arranging a visit to Letchworth during the run of the Exhibition, and this visit will take in an inspection of the factory.

S. WOLF & COMPANY, LIMITED,

115, Southwark Street, S.E.1

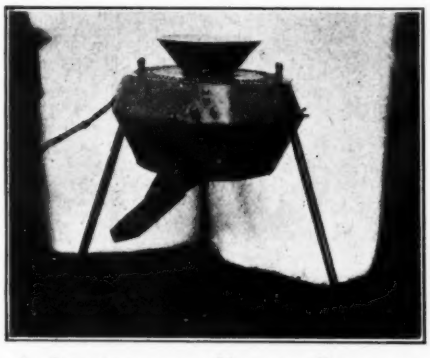
This firm, which specialises in portable electric tools, are exhibiting electric hand grinders, some of which have a flexible shaft attachment for grinding and drilling; electric drilling machines; and an electro-pneumatic hammer, for dressing castings. All these are portable. The electro-pneumatic hammer is shown in a modified form, having a flexible shaft grinding and drilling attachment. For the pattern shop, the following machines are shown and are of considerable interest:—A bench planer, with self-contained electric drive, and a bench band saw, with self-contained electric drive. The stand is in charge of Mr. H. Richards.

THE UNIVERSAL SYSTEM OF MACHINE MOULDING AND MACHINERY COMPANY, LIMITED,

97, Queen Victoria Street, London, E.C.4.

This firm, which handles the British sales of the well-known Bonvillian & Ronceray Company of Paris, are showing a horizontal pump and P.4 accumulator for the purpose of driving the various moulding machines. An entirely new exhibit is the E.I.3 standard moulding machine, the main feature of which consists of a greatly improved down-sand-frame. This down-sand-frame has perhaps never been really understood in Great Britain, but it is proving a revolution on the Continent in the ramming of moulds.

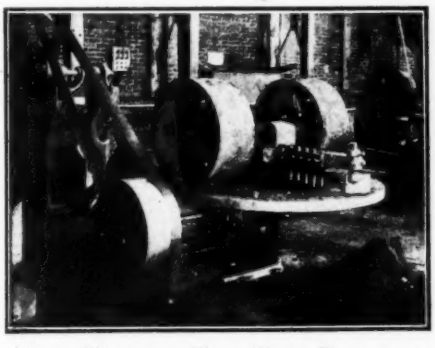
A complementary exhibit is the E.I.R.3 type of roll-over moulding machine. This is a corresponding sized machine to the E.I.3 machine, but incorporates the roll-over mechanism. This machine is also fitted with the new down-sand-frame previously mentioned.



A SAND-PREPARING MACHINE—UNIVERSAL SYSTEM OF MACHINE MOULDING.

A further complementary exhibit is a S.A.3 assembling and pushing-out machine which operates in conjunction with the above two machines. This machine closes the two moulding boxes and pushes the mould completely through the boxes, enabling castings to be cast without boxes.

No Ronceray exhibit would be complete without the D.F.4 high-speed moulding machine. This remarkable moulding machine is fairly well known in this country, but the latest model has many new improvements which makes it superior to anything previously shown in this country. The machine rams the cope and drag of the mould simultaneously. It then withdraws the pattern,



SAND MILL OF NEW TYPE—UNIVERSAL SYSTEM OF MACHINE MOULDING.

closes the mould on the machine, and eventually pushes the complete mould through the moulding box. The speed of production actually obtained in the firm's demonstration foundry at present is averaging 350 moulds per day with two labourers.

If the industrial conditions permit there is to be shown an entirely new development, comprising a sand aerator, disintegrator and conveyor machines (Spencer-Beech). These three operations are carried out by the one machine, and if possible a machine of this description will be exhibited. The sand is thrown into one of Monsieur Ronceray's new sand hoppers—a tall, cylindrical tube situated in between the moulding machines so that the operators will not have to bend their backs in getting sand for the moulding boxes.

Another new development is a "transrouler" or mould conveyor. This mould conveyor conveys approximately five small moulds at a time on small perforated tin trays. The moulds are cast on these trays, and consequently a very clever and simple method of weighting the moulds down has been designed.

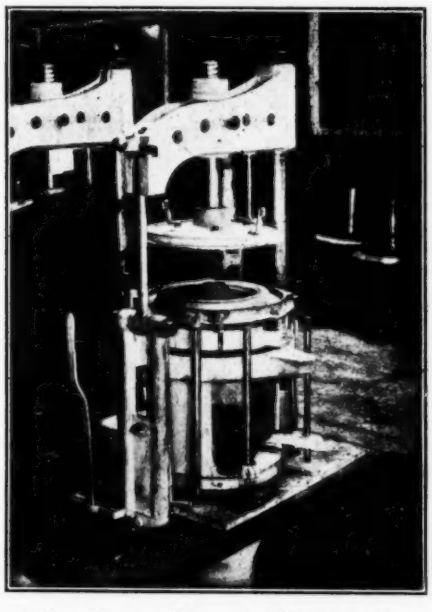
Considerable strides have been made since the 1924 Exhibition with sand mills, and the firm has now evolved a flat tabled sand mill without any sides, which is continuous in its operation. The machine is being shown for the first time in Great Britain, and it will be seen that the sand is fed in at one side, and after a certain period of milling it is thrown off automatically on the other side of the table.

A portable sand disintegrator and a small size core sand mixer of the bread-kneading type, are both shown, as well as a large size mixer of the stationary type.

During the run of the Exhibition, demonstrations will be given of the making and air drying of cores made from "Phixine."

Pattern-plates, stripping-plates and core boxes, made by a patented method by a moulder without any machining, will be on view.

"Exo" type pulley blocks constitute one of the latest creations of this house. The usual types



A NEW TYPE OF MOULDING MACHINE—UNIVERSAL SYSTEM OF MACHINE MOULDING.

of pulley block on the market are composed of masses of cast iron, thus making the blocks very heavy and very large. In the case of the "Exo" all the cast iron has been eliminated and hardened steel of the very highest quality substituted. Consequently it has been possible not only to reduce the size of the sections but the weight also, thus making an extremely light and strong block which is at least 50 per cent. lighter than the ordinary block on the market for the same lifting capacity. They are also showing results of their latest experiments in a 4-cwt. gearless block which is still lighter than the geared blocks described above.

The stand will be in the complete charge of Mr. A. S. Beech, but it is anticipated that during the Exhibition Monsieur E. Ronceray, the Managing Director, will also be available. Mr. Beech will be assisted by his assistant, Mr. F. C. Durnan, and a staff of machine moulders and mechanics, etc.

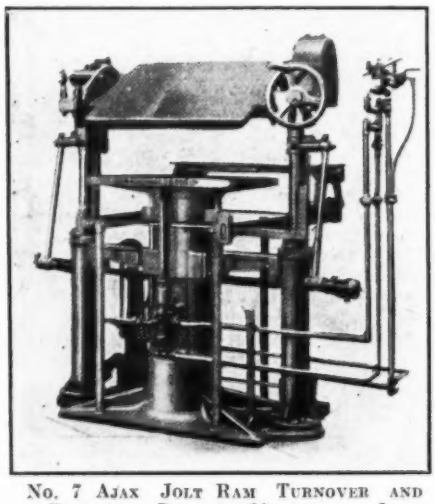
The manufacturing plant at Choisy le Roi, near Paris, is available for inspection at all times.

Foreign agencies have been established in the following countries:—South America, Belgium, Spain, Italy, Portugal, Czecho-Slovakia, Germany, and at the present time negotiations are proceeding for an agency agreement in India.

JOHN MACDONALD & SON, LIMITED,

Watt Street, **Maryhill**, *Glasgow, N.W.*

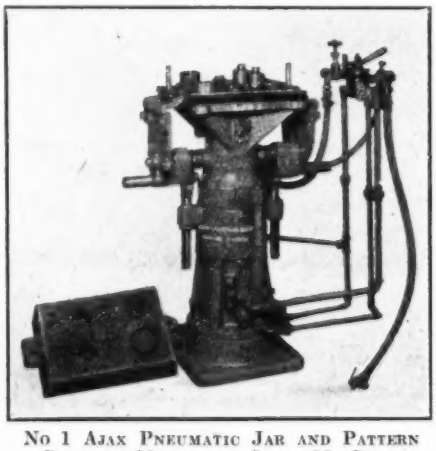
The principal exhibit consists of one of a No. 6 "Ajax" pneumatic jolt-ram moulding machine. This machine incorporates all the latest improvements, which include a worm and wheel for turning over, an oil-controlled pattern drawing arrangement; the oil pattern-draw on the machine is particularly neat, and eliminates the necessity of a separate tank to contain the oil. It is fitted with a new single control valve, which makes the operation of the "Ajax" turnover moulding machine



No. 7 AJAX JOLT RAM TURNOVER AND PATTERN DRAWING-MACHINE. JOHN MACDONALD & SON, LIMITED.

very simple. All the operations are controlled by the one handle, which is moved along a dial on which is stamped the various movements.

A newcomer is a No. 1 "Ajax" pneumatic jar and pattern-draw or stripping plate moulding machine, which has not previously been shown at any exhibition, and is something novel in small moulding machines. This machine has an oil-controlled pattern-draw, and in designing this machine radial arms and lifting rods, which always require spanners to adjust them to the various positions necessary for various sizes of boxes, have been dispensed with; instead, there has been



No 1 AJAX PNEUMATIC JAR AND PATTERN DRAWING-MACHINE. JOHN MACDONALD & SON, LIMITED.

introduced a straight-line movement, controlled by compressed air. The box lifters or adjusters are always under air pressure, therefore, if the operator requires the adjusters moved to suit increased length of box, he merely turns a handle on either side of the machine, and the air does the rest.

There are also on show a few "F.A.M." pneumatic chipping hammers and sand rammers, the valve movements of which are worthy of special note, on the grounds of simplicity, combined with efficiency.

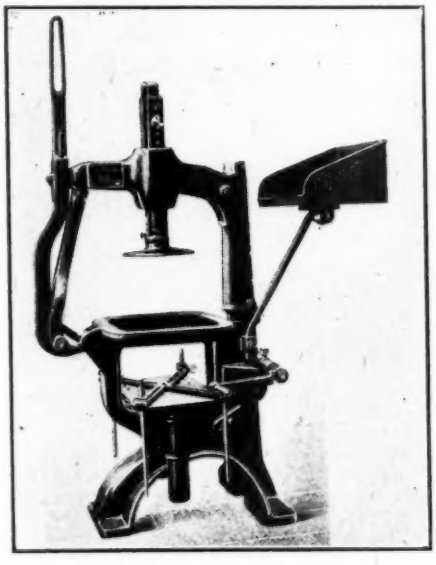
"Ajax" moulding machines are made entirely at Maryhill, Glasgow, and the directors have thrown open their works during the run of the Exhibition for inspection.

ETABLISSEMENTS A. SISSON-LEHMANN,

18, *Rue de Montjoly, Charleville, France.*

This firm have only just entered into the British foundry equipment field, and their products will no doubt be critically examined. They are showing a rotary table sand-blast machine. The table is 64 in. diameter, and the hourly output is in the region of 1,000 lbs. It takes castings up to 55 in. × 16 in. × 12 in., and requires a 9-h.p. motor. The machine is produced on a quantity production basis.

A moulding machine, type C.O., is shown fitted with a reversible pattern plate, a 18-in. × 14-in. box and the resultant casting.



C1 TYPE OF MOULDING MACHINE, BY A. SISSON-LEHMANN.

The machine C1, which we illustrate, is well known on the Continent, as more than 700 have been installed in France and Belgium.

The stand is in charge of Monsieur L. Lehmann, but for the first two days Monsieur A. Sisson Lehmann, the chairman of the company, will also be present.

Agencies have been established in Belgium (Mr. E. Bierlaire, 313, Rue François Gay, Woluwe St. Pierre) and Holland (Mr. E. Hamer, Nijmegen), whilst it is expected that a British agent will be appointed in the near future.

BEECROFT & PARTNERS, LIMITED,

St. Peter's Close, Sheffield.

This stand is divided into four sections, enclosing a central office and rest room. On one section there is shown a series of core oils. A second section is devoted to various cores of an intricate character made with these oils by the exhibitors' clients. In a third section is shown a range of fluxes for use in the ladle, brass and aluminium foundries. At the fourth corner of the stand are shown exhibits dealing with foundry consultation, chemical and physical testing of metals, etc. Mr. F. J. Beecroft and Mr. W. B. Jenkinson are in charge of the stand, along with a member of the metallurgical staff. The laboratories and works are open to inspection any time during the run of the Exhibition. Agencies have been established in Australia, South Africa, India, and the firm are just completing arrangements for the Continental countries. For testing the firm is able to give certified test sheets, as their machines are approved and passed by the Board of Trade, and their chemical reports are accepted by leading firms and railway companies.

BAGSHAWE & COMPANY, LIMITED,

Dunstable Works, Dunstable.

This firm has an international reputation for malleable chain and apparatus built therefrom, especially conveyors. Being large foundry owners they have first-hand knowledge of the basic requirements of the handling problems to be associated with the industry. They have prepared for the visitors an interesting exhibit, comprising, *inter alia*, a working model showing typical examples of a continuous bucket elevator (Fig. 1); an elevator with intermittent buckets; stoves—in fact, any article having a flat surface. A selection of Bagshawe's "B. B." elevator, conveyor and driving chains complete the exhibit.

Mr. Gerald Bagshawe will spend as much time as his business engagements will permit at the Exhibition.

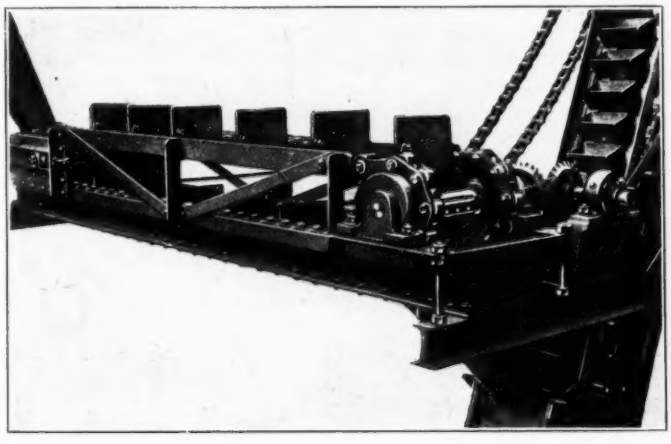


FIG. 1.—A CONTINUOUS BUCKET ELEVATOR— BAGSHAWE & COMPANY, LIMITED.

A branch company—Les Chaines Union, 155, Boulevard Haussman, Paris—has been established.

The firm have thrown open their foundry for an official visit by members of the Institute of British Foundrymen during their Convention.

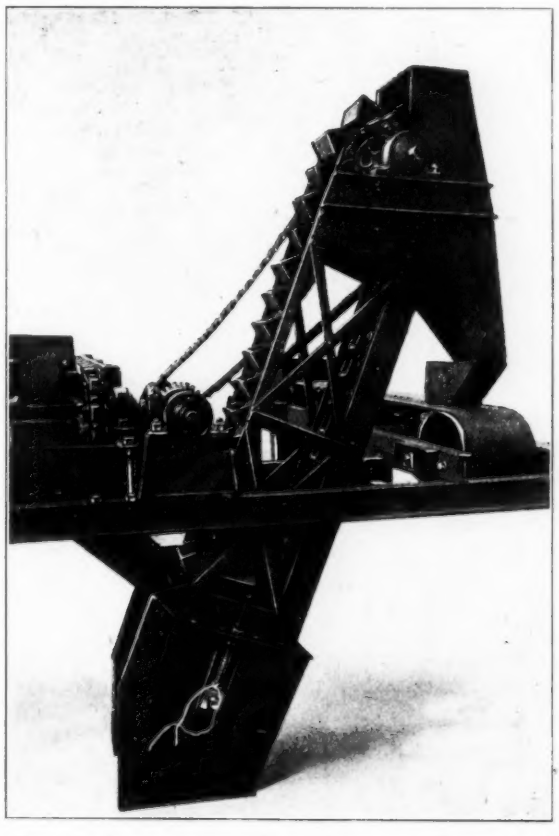


FIG. 2.—A COMBINATION BAND CONVEYOR— BAGSHAWE & COMPANY, LIMITED.

a band conveyor and a scraper or push-plate conveyor (Fig. 2). The use of these elevators and conveyors is increasing daily in this country, and are undoubtedly of paramount interest to foundry owners.

A working model of a gravity conveyor is also shown, and represents a non-power-consuming unit capable of infinite applications in foundry practice, as, for instance, moulding boxes, cores, mould

CONSETT IRON COMPANY, LIMITED,

Consett, Durham.

The exhibit which this important manufacturing company are showing is confined to a complete range of pig-irons—both hematite and foundry—many grades of firebricks and cokes, various silica shapes, and a selection of steel plates and sections. Mr. J. M. Mathieson is taking charge of the stand.

THOMAS E. GRAY & COMPANY, LIMITED,

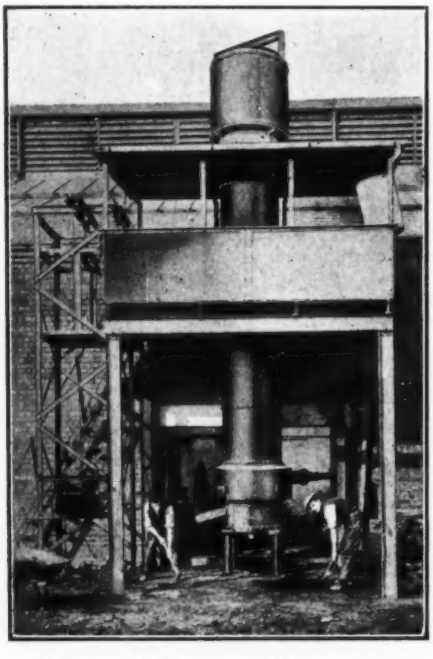
119, *High Holborn, London, W.C.*1.

This well-known firm of refractory material specialists have converted their stand into a section of a quarry, the face of which is not really composed of the raw material in Silacene. Mr. T. E. Gray will personally take charge of the stand. Export of Silacene is regularly made through London, Hull and Liverpool.

ATLAS PRESERVATIVE COMPANY, LIMITED,

*Deptford, London, S.E.*8.

This firm, which has branch offices at 15, York Street, Glasgow; 31, Dublin Street, Regent Road, Liverpool, and 112, Merchants Exchange, Docks, Cardiff, are showing scale models and photos of typical structures coated with "Atlas Ruskilla" iron and steel preservative paint, the prototypes of one of the former being shown in the accompanying illustration. The claims made for this material are exceptional, and must appeal very strongly to those concerned in the economic upkeep of foundry plant and equipment. There is something revolutionary in the idea of a paint that



A Cupola Installation Treated with Atlas Ruskilla.

can safely be applied directly over a rusty surface. But the manufacturers state that as "Ruskilla" is really rust-inhibitive, it neutralises the rust particles present at application and prevents further rust-growth. Once in contact with the cleansed metal, "Ruskilla" forms a tough covering which resists most successfully such adverse influences as acid fumes, steam saturation, extremes of and rapidly changing temperatures, in addition to the elements. Moreover, being elastic, it does not chip, crack or peel, but expands and contracts with the metal.

In the buying of paint, covering power is an important factor. Some paints cover relatively small areas, but under normal conditions "Ruskilla" covers approximately 600-800 sq. ft. per gallon. "Ruskilla" is made in black and six colours, and is packed in 1-gall. and 5-gall. drums. It dries with a glossy surface.

Stocks are held at practically every foundry centre in Great Britain, and foreign visitors are almost equally well catered for, as "Ruskilla" stocks exist in the following cities:—Alexandria, Amsterdam, Antwerp; Australia: Melbourne, Sydney; Bangkok, Barbados, Bermuda, Bombay, Calcutta, Capetown, Christchurch (N.Z.), Colombo, Copenhagen, Durban (East Africa), Kilindini (Mombasa), Elizabethville, Gibraltar, Gothenburg, Hongkong, Hamburg, Penang, Rangoon, Singapore, Port Elizabeth, Trinidad, Oslo, Valparaiso, Vancouver, Wellington. Names and addresses can be quoted on application.

The stand is in charge of Mr. E. J. Penstone.

WILLIAM CUMMING & COMPANY, LIMITED,

Kelvinvale Mills, Maryhill, Glasgow, N.W.

In addition to the address given above, the firm has factories in Falkirk, Chesterfield, Middlesbrough and Bilston, which enables the rendering of service to foundrymen of material character, taking into consideration the reduction in freight and the inter-exchange of technical experience gained in the various works. The firm's products are mainly graphite, plumbago and coal dust, and of these they are showing a complete range. The whole of their products are controlled by a central laboratory situated in the Glasgow works.

This stand at the Exhibition will be under the control of Mr. C. H. V. Wilson, the London representative of the firm, and he will be assisted, amongst others, by Mr. H. Phillips (Midlands representative), Mr. A. Hares (West and South Wales representative), Mr. E. A. Carlisle (North Midlands representative), Mr. F. A. Harper (North-Eastern representative), and by other members of the staff in turn, so that visitors may rely upon always finding some responsible individual on duty.

There are no foreign agencies at the moment, but some of the most prominent export firms in Great Britain regularly handle their facings, and they are continually exporting direct to various parts of the world from the head office and works at Glasgow.

MONOMETER MANUFACTURING COMPANY (1918), LIMITED,

Savoy House, 115-116, *Strand, London, W.C.*2.

This firm are exhibiting a Monometer patented process of pressure die-casting for making axle-box bearings and housings for rolling stock and for bushes, and a Monometer simplex pressure die-casting machine for the pressure die-casting of various parts of automobiles, wireless parts, for miscellaneous work. This machine has replaced in a great many cases the finished brass parts through the utilisation of a new zinc-base alloy. Of interest to light alloy foundries is an aluminium melting furnace for ladling direct into chill or sand moulds, whilst the tilting type furnace with Monometer patented tantulum iron crucibles is of general interest to non-ferrous foundrymen.

The well-known Monometer white metalling furnace for the manufacture, production and refining of all white metals and lead base alloy, with the latest method of mixing by mechanical process, is being shown. This furnace is automatically temperature controlled, and fitted with the patent anti-oxidation system.

The representatives in charge of the stand are Mr. I. L. Hall, Mr. Wright, Mr. Lanston Dudley Hall and Mr. Herbert V. Hall.

The Monometer plant at Tipton, Staffordshire, is available for inspection during the run of the Exhibition, and at the same time it will be of interest to many to see the large pressure casting plants which are being made for the following overseas railways:—Great Indian and Peninsula Railway, Madras and Southern Mahratta Railway, Bengal and Nagpur Railway, and the Gold Coast Railway.

For the benefit of foreign visitors we append a list of the principal agents:—Germany: Georg W. Bergner, Puttkamerstr. 10, Berlin, S.W.48. France: Henri Togni, 55, Avenue Marigny, Fontenay sous Bois. Belgium: Fr. Van Droogenbroeck, 21, Rue Georges Moreau, Brussels. Denmark: Lawrence Paisley, Vester Voldgade 7 and 9 B, Copenhagen B. Sweden: Vilhelm Johnsen, Stockholm 3. Argentine: Percy Grant & Company, Limited, 25, De Mayo, 489, Buenos Ayres. India: Capt. T. V. Lynn, 18, Military Square, Fort, Bombay. South Africa: Dowson & Dobson, Limited, Corner of Simmonds and Anderson Streets, Johannesburg. Australia: E. Treliving, Light Square, Adelaide. U.S.A.: Monometer Monarch Engineering and Manufacturing Company, 1,206, American Buildings, Baltimore, Md. The last-named agency is manufacturing Monometer furnaces for U.S.A. and North America.

THOMAS & BISHOP, LIMITED,

37, Tabernacle Street, London, E.C.2.

"Cling-Surface" and "Erusa" belt treatments constitute the principal exhibit of this firm. The advantages obtained from the treating of a belt with Cling-Surface are demonstrated on a plant comprising a motor driving a countershaft by means of a leather belt, running vertically, and from the countershaft to a 4-kilowatt generator by means of two belts running horizontally, one belt being treated and the other untreated. The increased efficiency of the treated belt will be shown, as against the untreated belt, by means of a voltmeter and a bank of lamps.

"Permac" jointing material is another speciality shown. The universality of the use of Permac, combined with its efficiency and extremely cheap initial cost, is demonstrated by a series of joints, which include flanges, screwed-piping, traps, etc. Water at a pressure of 250 lbs. per sq. in. is employed, and joints are being broken and remade at all times of the day, with the object of showing that no time is necessary for setting when Permac is employed.

A working model shows various types of lubricators using Flexo Grease, which is manufactured in nine densities. This variation is an important feature, and only applies to grease made by this concern.

"Flexo" leather and textile belting are, by a unique process, treated with Cling-Surface preservative during the course of manufacture. They can be fitted direct, without any preparation, and will take up full load immediately on being put into use, without fear of slip and without any initial tension.

An oil reclaiming plant, which is not a filter, is exhibited to demonstrate a method of reclaiming dirty oil, and a sample of cleaned oil is available for inspection.

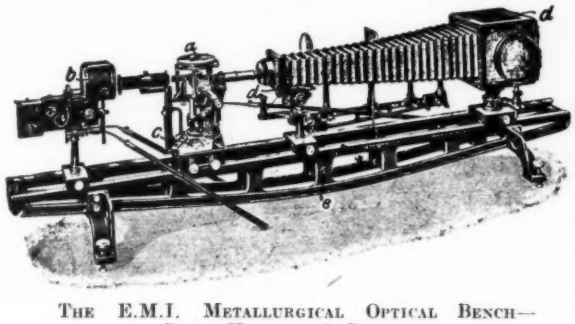
Finally, there are refractory cements A and B for boiler bridge work, stopping air leaks in boilers and flues, and hot and cold patching.

Mr. C. V. Bishop is in charge of the stand, and he is prepared to arrange for visitors to inspect their London works.

CHAS. HEARSON & COMPANY, LIMITED,

68, Willow Walk, London, S.E.1.

The principal exhibit is the large metallurgical microscope E.M.I., consisting of a large optical bench, a lamp, a microscope, a camera, and an apparatus for the production of comprehensive images under low magnification. It is supported



THE E.M.I. METALLURGICAL OPTICAL BENCH—CHAS. HEARSON & COMPANY.

by powerful springs to avoid vibrations. It is provided with an interchangeable illuminating apparatus by the interposition of a prism or a plane glass plate, depending upon the object under observation.

Additionally, there is on show a "Reichert" ore microscope. Apart from microscopy, there is exhibited an electric muffle furnace and an all-metal drying oven.

THE POWELL DUFFRYN STEAM COAL COMPANY, LIMITED,

Cardiff.

This concern is exhibiting foundry coke, furnace coke, coke screenings (size 1 to 1½ in.), coke peas (size ⅝ to 1 in.), and coke breeze (size ⅛ to ⅝ in.) from their Bargoed coke ovens, whilst from the by-product works they show whizzed naphthalene salts, rectified solvent naphtha, heavy solvent naphtha, anthracene oil, strained anthracene oil, super black varnish, refined tar, creosote oil, coal tar pitch and tarbit. In addition, various types of bricks are being shown, including Rhymney Iron (controlled by the Powell Duffryn Company) Company's "Rico" special quality firebrick. Mr. L. T. Davies is in charge of the stand.

Welsh coke is much esteemed amongst London foundrymen, and the Powell Duffryn Company are amongst the most important producers. They have three coke batteries of 50 ovens each; 100 of the ovens are Kopper and 50 Carl Still. The total annual production from these ovens is about 260,000 tons of coke of all descriptions. All the ovens are regenerative by-product ovens.

Should any visitors wish to inspect the Powell Duffryn coke oven plant, it can probably be arranged. Whilst the company has no foreign agencies, it has in France an associated company, the Cie. Française des Mines Powell Duffryn. Coke for export is handled either direct or through the Maris Export and Trading Company, which company they control.

JOHN MACDONALD & COMPANY,

43, King Street, **Pollokshaws**, *Glasgow.*

This well-known firm is showing a complete range of "Cleveland" pneumatic tools, including chipping and riveting hammers, sand rammers, core breakers, portable ball-bearing grinders, metal and rock drilling machines. Most foundrymen will be interested in the latest type of "Berkshire" Model H air-operated jolt-squeeze moulding machine, which is mounted on wheels. The machine is fully equipped with side trays, vibrator, blow gun, etc.

Amongst other interesting exhibits are a portable electric sand-riddling machine, a display of steel grit for use in the sand blast plant, air-saving fittings, including various types of "Cleco" pressure-seated air valves and "Bowes" automatic airtight hose couplings, and vibrators, blow guns, hose, hose clamping tools and numerous accessories. The stand is in charge of Mr. J. Whitehead and Mr. Y. E. Key.

RAPID MAGNETTING MACHINE COMPANY,

Magnet Works, Lombard Street, Birmingham.

This firm, which is unique in so much as it is the only British concern manufacturing electro-magnetic separators, are showing an interesting range of machinery. The standard type is designed for removing iron from metal turnings, dust and small non-magnetic substances, and are particularly suitable for treating aggregations containing a large percentage of iron.

Various types and sizes of electro-magnetic separators are shown for extracting iron in many forms from foundry sand, coal clinker, wood chips, of which the drum and screen types present the most interest. This type (P) is suitable for use with a belt conveyor, in which case the belt action automatically throws the extracted magnetic material at the back-bottom position. Type K consists of a stationary shaft upon which is mounted half-circular pattern electro-magnetic coils, which produce a magnetic field on the front half of the drum only. About this and totally enclosing the windings is revolved a brass-ribbed cylinder which is mounted on ball bearings of the self-aligning dust-proof type, and a suitable pulley drive is obtained by means of an extended sleeve, which is spigoted and fixed to one of the end covers.

The stand is in charge of Mr. Wm. E. Box.

LYSBERG, LIMITED,

66, Cannon Street, London, E.C.4.

This exhibit is confined to the showing of North's Navigation Collieries, Limited, range of foundry cokes. The stand is in charge of Mr. F. A. Buckley and Mr. F. C. Ford. The coke-oven plant is available for inspection during the run of the Exhibition. Foreign visitors will be interested to learn that agencies have been established at Paris, Lisbon, Genoa, Piræus, and Casablanca, shipments being made at all Bristol Channel ports.

XUM

OGILVY & COMPANY,

20, Mortimer Street, London, W.1.

The principal exhibits of this firm are the new Leitz metallurgical microscope with camera (Micro-metallograph) and the Binocular magnifiers. In addition there is a large range of microscopes suitable for all classes of work and a variety of electric microscope lamps suitable for both visual work and photomicrography.

A MICROSCOPE FOR THE EXAMINATION OF SANDS —OGILVY & COMPANY.

Leitz Micro-Metallograph. — This well-known apparatus has recently been re-designed and embodies important optical and mechanical innovations giving the utmost efficiency and simplicity in use. The iron legs and table stand are constructed to give the maximum rigidity and convenience for the operator. To meet the need of workers who are seriously affected by vibration,

BINOCULAR MAGNIFIERS—OGILVY & COMPANY.

the optical bench may be fitted with a vibration absorber which consists of a resilient mode of suspension of the optical bench and which permits photography with the highest magnifications under practically any conditions. The microscope is of the usual inverted type, but it is noteworthy that the fine adjustment actuates the objective and holder only, thus saving wear and increasing accuracy. The vertical illuminator is fitted with interchangeable plate glass and prism reflectors both of which are permanently fitted to the illuminator, and either can instantly be brought into action by pushing or withdrawing a spindle. The photographic camera has an extension of 40 ins. and takes ½ and ¼ plates. The front panel is fitted with an observation prism by means of which the image on the focussing screen can be observed and all adjustments can be made from the central position of table stand.

Achromatic 16 mm. and 8 mm. oil-immersion objectives for metallurgy are shown working and are a considerable improvement on similar dry objectives. The troublesome flare spot from the polished surface of the metal is easily eliminated and the resultant image is crisp and flat.

Of considerable interest to the working foundryman is an exhibit of Binocular Magnifiers which give magnifications from 3 to 30 diameters. These are eminently suitable for the examination of fractures of castings owing to the large field of view, depth of focus and long working distance. They are interchangeable on a variety of stands.

Workshop microscope for measuring Brinell impressions should be of paramount interest for those engaged in the manufacture of automobile castings, whilst the electric grinding and polishing machines for preparing micro specimens should be studied by those who have metallurgical laboratories.

An ore dressing microscope, which is also shown, is to our mind badly designated, as it imposes a non-existent limitation. It is specially applicable for the control of grain size in moulding sands and should command the close attention of every visitor.

The stand is in charge of Messrs. A. G. Woodger and C. A. Smith. Mr. Ogilvy has consented to open his workshops at Mortimer Street and Kenton Street for inspection during the run of the Exhibition.

H. G. SOMMERFIELD,

Charterhouse Chambers, Charterhouse Square, London, E.C.1.

A number of varied interests are catered for on this stand. Primarily, a large range of special irons emanating from some of the largest and best-known blast furnaces in Great Britain. Then a speciality has been created in "Safety" clothing—spats, sand-blast helmets and gauntlets. These are all of a pattern which satisfies Home Office Regulations. Another aspect of "Safety First," illustrated by exhibits, is covered by a very complete set of goggles for furnace work, fettling, welding, and sand blast. Another exhibit of outstanding interest is a collection of castings made from cronite—the well-known nickel-chromium alloy. Periodically there are to be demonstrations with the spectroscope showing the danger to which furnacemen submit themselves through the emanations of ultra-violet rays. Mr. Sommerfield, so far as his duties as Conference Secretary will allow, will personally take charge of the stand.

SYDNEY EVANS,

9, Bush Lane, Cannon Street, E.C.4.

Mr. Evans is the British representative for Messrs. Ketin & Thiriart, a Belgian firm, established in 1893. At the commencement of their activities they manufactured small foundry equipment, but with gradual development they extended operations until to-day they produce every machine or apparatus generally considered necessary in iron, steel, and non-ferrous foundries, whilst they construct apparatus from the smallest ladle to largest cupola, and their products are on the lines of most modern practice. The works were completely destroyed during the war, but are now completely rebuilt, and are one of the most important works engaged upon the manufacture of foundry equipment.

The principal exhibit is a sand-preparing plant, which combines a robust sifter, mill and disintegrator, compactly arranged and capable of producing 4 tons of prepared and aerated sand per hour with the low operation-charges of one man only. Although it has only been on the market for some 15 months, more than 50 installations are actually in use in various French, Dutch, and Belgian foundries.

Mr. Evans also represents Soc. Anon. Silica, who claim to have the largest deposit of naturally

bonded steel foundry sand in Europe. It comprises some 550 acres. Samples of this are being shown.

Another exhibit is Demonite refractory lining material for cupolas, which is made by Pittevil & Company.

JAMES KEITH & BLACKMAN COMPANY, LIMITED,

27, Farringdon Avenue, London, E.C.4.

So far as foundries are concerned the name of this firm is always associated with fans, and obviously they form the principal exhibits, chief amongst which are centrifugal fans for cupola blowing. A range of these is available for bringing down from ½ to 20 tons of metal per hour at working pressures of 10- to 30-in. water gauge. These fans give a large volume of air at a constant pressure, resulting in a uniform reduction of metal and lengthening the life of the cupola lining, together with a considerable power saving over positive blowers.

A second type of fan for exhausting from producer gas plants and passing the gas at a pressure to the engine, will interest the engineer, whilst fans for air feed to crucible furnaces, oil-fired furnaces, are of interest to both the ferrous and non-ferrous founder.

Those who use town's gas for fuel will find a series of boosting fans for raising its pressure worth careful study. The enforcement of the Cleaning of Castings Regulations gives added interest to the range of fans shown suitable for dust, smoke and fume removal, whilst the small portable fans for local ventilating, blowing dust from moulds, electrical apparatus, etc., are of real interest to every type of foundry.

An entirely new exhibit is a Dust Separator Fan for the removal of grit, etc., from air or flue gases, the fan and separator being a single unit. This fan, a working of which is shown, has a specially constructed housing designed so that the dust and grit contained in the air or gas handled by the fan is automatically separated in the housing, the cleaned air or gases being discharged at the usual fan outlet, and the dust or grit passing into a hopper from which it can be removed as required.

The new apparatus is particularly suitable for separating the grit from flue gases; sand or grit from air in connection with sand-blast machines; and many kinds of dust usually collected by pneumatic means from industrial plants generally.

The machine is very compact, taking up little more room than an ordinary fan, and dispenses with the usual bulky dust separator of the cyclone type and its supports, thus also simplifying the pipe connections. Another advantage of this apparatus is that it does its work with a smaller expenditure of power than is required in a combination of a fan and cyclone separator. The latter system also costs, fixed complete, from 35 to 40 per cent. more than the new system.

Of general, rather than of foundry interest, is the "Pilot" Domestic Boiler for hot water supply, which constitutes a new speciality of the firm.

A Crucible Furnace, fired by high-pressure gas, and a number of 1,500 c.p. "Keith" high-pressure suspension gas lamps, complete one of the most interesting stands in the Exhibition.

The export business of this house, except to the United States of America, Canada and the Irish Free State, is conducted through The Blackman Export Company, Limited, of 374, Euston Road, London, N.W.1.

SKYLUX, LIMITED,

22, Great Saint Andrew Street, Shaftesbury Avenue, London, W.C.2.

"Skylux" patent tube and rod benders are the principal exhibits of this concern, and are being practically demonstrated. They are made to cover various requirements. Nos. 1 to 4 machines are principally constructed for bending gas, water, steam and kindred tubing. They can be used either in their portable state or converted into bench tools.

Every kind of bend can be made, as well as complete coils, and moreover they can be attached to and detached from the tube or rod at any point for purposes of correction or for taking out kinks.

Nos. 5 and 6 machines deal with light gauge copper and brass, solid and split electric conduit, while types A and B are for ferro-concrete rods only, all the work being done cold.

BESSLER WAECHTER & COMPANY, LIMITED,

Salisbury House, E.C.2.

This firm is showing the grades of pig-iron made by the Royal Dutch Blast Furnaces built during the years 1920-1923 at Ymuiden, Holland, consisting of a series of fractures showing the range of analyses produced. These include, over and above the standard grades Nos. 1 and 3, a number of special qualities varying the phosphorus and manganese contents to meet the widest possible range of requirements. Specimen castings made from this iron are also shown.

Low-carbon pig-iron, made at Utrecht, Holland, under the direction of the Royal Dutch Blast Furnaces, is another exhibit. The special characteristic of this iron is a maximum carbon content of 2.8 per cent., or, if desired, down to a maximum of 2.4 per cent. The silicon can be varied from 0.5 to 3 per cent., and the phosphorus from 0.06 to 0.6 per cent., and several fractures are shown of a range of grades to meet the requirements of manufacturers of cylinders for locomotives, Diesel engines, motor cars, turbines, etc., and for other special castings where strength and toughness are essential.

Different grades of ferro-silicon, ferro-chrome, ferro-titanium, ferro-tungsten, ferro-vanadium, manganese metal, etc., are also shown.

In an exhibit relating to dead burnt magnesite of Austrian quality there are shown samples of different standard sizes and specimens of magnesite bricks.

Finally, there is exhibited achromine artificial corundum, made by the Soc. Anon. Achromine, at Jarrie, France. Samples are shown in lump and grain form of each of the three grades, containing 88-92, 92-95 and 95-98 per cent. alumina respectively, which should be of interest to those engaged in the abrasive industry.

BRITISH DRYING AND HEATING COMPANY, LIMITED,

433, Abbey House, Victoria Street, London, S.W.1.

This exhibit consists of Oehm's heating elements in both portable and permanent built-in forms. The portable elements shown are of two sizes of both horizontal and vertical types, a new feature in the former being the introduction of a special air container of heat-resisting metal, which replaces the preheating coil. This feature, which renders the nozzle easily accessible, has only recently been introduced, and has not previously been shown. A portable floor drying element, complete with a compressor, etc., is shown, mounted on a mould illustrating the method of application. Unfortunately, it has been found impossible to show the heating elements under actual working condition, but experienced foundrymen will, we feel sure, be able to appreciate the principles. In addition to these, a sectional model of the permanent built-in element is shown, together with one of the smallest size of floor driers.

They also show a new machine for the preparation of sand. This machine is electrically driven, and has the advantage of being portable, so that it can be worked in any part of the foundry, thus saving the moving of the sand.

The stand is in charge of Mr. J. D. Allan, Mr. N. G. Calder, and Mr. H. C. Turner, one or all of whom will always be in attendance.

BRITISH & CONTINENTAL TRADERS, LIMITED,

Astor House, Aldwych, London, W.C.2.

The exhibits of this well-known exporting house consist mainly of samples of pig-iron and some castings.

Messrs. H. Shillitoe, T. F. Gilbert and R. Eppenberger are in charge of the stand.

Representation in foreign countries is as follows:—

France.—Mr. R. Eppenberger, 41, rue de Liège, Paris.

Belgium.—Mr. R. Eppenberger.

Italy.—Messrs. A. Pestalozza & Co., Via C. Colombo 10-5, Sampierdarena.

Spain.—Mr. J. Foster, Banco de Bilbao, 1, Bilbao.

Holland.—Messrs. Verburgh & Zoon's Handelmaatschappij, Postbus, 1,138, Rotterdam.

XUM

GRAFTON & KNIGHT, LIMITED,

2, Pembroke Street, King's Cross, London, N.1.

This firm are demonstrating on this stand the peculiar properties possessed by their Spartan leather, of which they are the sole tanners and manufacturers. The tannage adopted in this case produces leather which is not affected by the action of water, steam, oil, acids, or alkali fumes. This, coupled with the water, heat, and steam-proof cement, of which they are also the sole manufacturers, produces leather belting which is eminently suitable for drives subjected to abnormal atmospheric conditions.

Spartan belting is shown actually running in boiling water, a very severe test both for the leather and the cemented joints. The Spartan tannage, furthermore, produces a leather of very high tensile strength, high frictional values, and extreme flexibility.

Photographs are shown on the stand of some of the largest belt drives installed in the country, illustrating the suitability of Spartan leather for use in conjunction with the modern high-speed "Lenix" or "Short Centre" system of driving. One of these, a 66-in. wide belt, transmits over 3,000 h.p. at 6,000-6,500 f.p.m. The "Lenix" or "Short Centre" drive is also shown in operation on the stand.

The stand is in charge of Mr. B. H. Aston, the managing director, and Mr. T. Cliff Bowen, the technical engineer. The firm is represented in Hamburg, Paris, Malmo, Brussels, Bombay, and Calcutta.

NOBEL INDUSTRIES, LIMITED,

Nobel House, London, S.W.1.

It is some five years now since "Necol" Plastic Wood was introduced as a novel accessory on the pattern-maker's bench. Since then its uses have been developed a hundredfold. It is a moist dough, which hardens by evaporation to a solid substance similar in its properties to wood. Its hardness, when dry, is about that of pearwood, its specific gravity about 0.75, and it can be papered and worked with a chisel in the same way as natural wood. Similarly it will receive nails and screws, but having no grain there is no tendency to split.

Pressed on to any clean surface, whether of metal or wood, while moist, "Necol" Plastic Wood remains firmly cemented to it when dry, and therein lies its usefulness. Since it can be moulded to a required shape, it can be used for filleting in patterns, shaping intricate parts, and for converting a damaged casting, or worn bearing into a pattern for moulding a new member. Its indifference to moisture makes it ideal for pattern purposes.

It is a very good electrical insulator, and since it does not absorb moisture from the air, this property is maintained. "Necol" Plastic Wood is manufactured by Nobel Chemical Finishes, Limited, Stowmarket, Suffolk, and is supplied in containers from ¼ lb. upwards.

MASTABAR BELT FASTENER COMPANY,

14A, *Blackfriars Street, Manchester.*

This firm, as its title denotes, specialises in belt fasteners, and they are showing a number of varieties, including their standard belt fastening tool, the "Baby" and the "Midget." A new tool recently devised is the "Mastabar" belt squaring and cutting tool. With the mechanicalisation of foundries, there is an ever-increasing demand for belts, and visitors should make themselves *au fait* with the latest developments.

The stand is in charge of the manager, Mr. W. Cookson Uff. The firm is in a good position for export business, and is represented in most countries, but there still remain a few vacancies.

THE TURBINE FURNACE COMPANY, LIMITED,

238*b*, *Gray's Inn Road.*

This firm are showing the "Turbine" Patent Furnaces as applied to Lancashire, Cornish, Cochran and other types of vertical boilers. The "Turbine" Furnace is designed for the utilisation of any class and grade of fuel, and attention is directed to the design of the air troughs, which are of diminishing cross-sectional area, giving an equal air-pressure under the whole length of the grate. By means of sub-division of the grate equal pressure is given over the width, resulting in an evenly burning fire over the whole length and width of the grate.

The "Vulcan" Patent Boiler Tube and Flue Cleaner is also shown. The use of this apparatus once per shift will keep the flues of any boiler free from any accumulation of dust, etc., and an increase of 5 per cent. efficiency is guaranteed on the application of the system, which can be applied to Lancashire, Cornish, Marine and Watertube boilers.

The stand is in charge of Mr. V. R. Chadwick.

THE INTERNATIONAL FOUNDRY EQUIPMENT COMPANY, LIMITED,

132, *Steelhouse Lane, Birmingham.*

Description of Exhibits.—The exhibit consists of catalogues dealing with the Rein cupola, together with the Rein patent construction for desulphurisation, expulsion of gases and refining of cast iron. The Rein construction is built up on scientific lines, and it is possible for very poor charges of pig-iron and scrap to be put into the cupola, the resultant product consisting of high-quality iron. Castings of various kinds are shown, along with technical data relating to high-duty cast iron as produced by the Emmel-Thyssen process. Test-pieces, photographs and other data will be on view with the idea of informing foundrymen the value of the process. Simplex weighers, which are used for the automatic weighing of cupola and other furnace charges, is another feature of the stand. A full description of the International rotary core making machine and samples of "EK" briquettes (ferro silicon, ferro manganese and ferro phosphorus) are also shown, together with full descriptive matter.

L'OUTILLAGE DE FONDERIE,

5, rue Gretry, Paris.

This well-known French foundry equipment house has specialised in fixed and portable drying stoves, using coke breeze as fuel, mechanical chargers for cupolas, radial moulding machines, and semi-automatic sand plants, and are showing a representative selection from these.

STERLING FOUNDRY SPECIALTIES, LIMITED,

Bedford.

The principal exhibit of this firm relates to moulding boxes, made from rolled steel bars of special section. An inspection of this stand provides the foundryman with a perspective of the infinite variety of boxes demanded by his industry. The stand is in charge of Messrs. Brakenbury and Cole. The works, which are described elsewhere in this issue, are open to inspection during the run of the Exhibition.

THE LILLESHALL COMPANY, LIMITED,

Priors Lee Hall, near Shifnal, Shropshire.

This company's exhibit consists of samples, etc., of various qualities of pig-iron, and cylinder and other castings made from that iron. Mr. A. Martin will be in charge of the exhibits. Foreign agencies have been established in France, Germany, and Czecho-Slovakia, and export facilities are available from Liverpool, Birkenhead or London.

C. F. R. GIESLER, LIMITED,

58c, Gray's Inn Road, Holborn, London, W.C.1.

This firm are showing two very interesting machines, one known as the Vibroshear, which shears sheet metal by vibrations, and the other the Vibrometer, which is designed to test and check quickly vibrations occurring in foundations and iron structure. This latter machine should be very interesting for the makers of mouldings. The exhibits are in charge of Mr. Wm. Hatto.

The Technical Exhibit.

This exhibit, which is of a non-commercial character, has been organised with the object of illustrating the tendency of research as applied to foundry work, something of the history of various sections of the industry; the apparatus available for the scientific control of processes, and a survey of some of the raw materials used. A number of scientific associations have collaborated with a view to showing these studies from a variety of standpoints. The exhibits are detailed either under the name of the co-operating body or a classified general description.

THE NATIONAL PHYSICAL LABORATORY, TEDDINGTON.

Organised by Dr. W. Rosenhain, F.R.S.

Experimental Furnaces, Refractories and Furnace Products.

High Frequency Induction Furnace Unit.—Suitable for 20 lb. melts of iron or copper alloys and mounted on trunnions so that the metal may be poured into moulds directly from the furnace. Supplied through the Electric Furnace Company, Victoria Street.

Induction Furnace Refractories. — Magnesia, alumina and other crucibles, together with carborundum-china-clay sleeves in which they are packed for use in small experimental induction furnaces. Special china-clay alumina crucibles for use in high-temperature research on nickel chromium alloys. Crucibles of electrically-fused magnesia.

Induction Furnace Products.—Specimens of iron and of nickel chromium prepared in the induction furnace. The small specimens are used for thermal and microscopic analysis, and the larger ones for the examination of rolling, forging and general mechanical properties.

Silit Resistance Furnace.—An alundum furnace tube heated by six "Silit" resistance elements supplied by the Electrical Equipment and Carbon Company, New Oxford Street, capable of working at temperatures up to 1,400 deg. C. The furnace is shown in operation.

Graphite Resistance Muffle Furnace.—A model showing the main features of a graphite ring electric resistance furnace designed to take a carborundum muffle. An actual muffle is also exhibited.

Thermostat Controlled Furnace.—A furnace used for heating specimens of metal for a long period at a constant temperature. Shown in operation.

Thermal Analysis.

A gradient furnace used for heating and cooling of metal specimens in order to determine the temperatures at which physical changes, marked by heat evolution or absorption, occur. Tubes, thermocouples and couple-protecting sheaths. Typical heating and cooling curves for cast-iron and other alloys.

Microscopic Analysis.

Specimens of cast iron and other alloys, polished and etched to reveal the microstructure, shown under microscopes. Typical photomicrographs.

Crystal Structure.

Models showing the arrangement of atoms in crystals of metals and alloys as determined by means of X-rays.

Pure Metals.

Very pure specimens of chromium, manganese, beryllium and iron, prepared at the Laboratory by special methods for research purposes.

Properties of Castings.

Casting Contraction.—An exhibit illustrating a method of measuring linear contraction of castings.

Metal Freed from Excessive Gas.—Specimens of ordinary and of metal treated by the pre-solidification and the nitrogen process.

Measurement of Density.—A balance arranged for the convenient determination of the density of castings.

THE RESEARCH DEPARTMENT, WOOLWICH.

Organised by Dr. H. Moore.

Segregation in Steel Ingots.

Sections of forged and rolled bars after pickling, and sulphur prints from the same sections, showing distribution of impurities and relation to segregation in the original ingot. Sulphur prints showing segregation in large steel ingots (1) top poured, (2) bottom poured.

Specimens illustrating recent developments in the electrolytic deposition of metals.

Applications of X-Ray examinations to metal castings and forgings. At the Research Dept., Woolwich, apparatus and technique have been developed for the examination of metal castings, etc., by X-rays. It is now possible to take a radiograph through over 4 ins. of steel and to reveal an internal hole of $\frac{1}{8}$-in. diameter in the centre of the specimen. A steel casting is shown with a series of radiographs which have been taken in the routine examinations of the casting and which show flaws of various kinds found in such castings.

Conjoint with the B.N.F.M.R.A.

Rolled Brass Strip.

Exhibits illustrating a research being carried out for the British Non-Ferrous Metals Research Association with the object of improving the quality of rolled brass strip.

Defective Strip.—Spilly surface. Blisters which form spills at a late stage of rolling.

Defective Ingots.—Defective surfaces. Internal unsoundness.

Ingot Sections.—Illustrating the effect of variations in detail of casting methods in the structure surface and internal soundness of slab ingots.

Ingots cast by new method A, which are free from internal defects which form spills on rolling.

Strip rolled from ingots cast by method A.

Ingots cast by new method B, which are free from internal defects and surface imperfections.

Strip rolled from ingots cast by method B.

Samples of brass alloy which resists corrosion and oxidation.

The Die-Casting of Brass and Bronze Alloys.

Die-cast test pieces and commercial die-castings of high tensile alloys.

Use of chromium plating for protection of steel cores and moulds from attack by molten metal.

Chromium plated Armco iron before and after exposure to molten aluminium bronze at 1,100 deg. C.

Samples showing comparative attack on various types of steel and cast iron.

UNIVERSITY OF SHEFFIELD.

Organised by Dr. C. H. Desch, F.R.S.

Apart from conjoint exhibits with research organisations, the Metallurgical Department is showing:—

Photographs showing the equipment of the Department of Metallurgy, including small steel works and research laboratories.

Chart illustrating scheme of technical foundry training in Sheffield under the auspices of the University.

Photographs showing the casting of Cupro-nickel ingots in the Department of Metallurgy during the War.

Transparencies illustrating the microstructure of cast metals.

Case containing Dr. Sorby's original metallographic preparations.

Refractory Materials.

Collection illustrating the work of the Refractories Department, as under:—(*a*) Raw and burned samples of Sheffield ganister and other silica rocks; (*b*) raw and burned samples of Sheffield "Cupola Ganister" and "Crucible Ganister"; (*c*) samples showing corrosion tests on refractory bricks; (*d*) samples of unused and used "Indian Sillimanite" bricks; (*e*) samples showing effect of variation in lime-content on colour of silica bricks; (*f*) samples showing change in texture and toughness of silica bricks on repeated burning; (*g*) enlarged photomicrographs of ganister, silica bricks, Mullite Sillimanite, core-sands and moulding sands, and samples of "synthetic" moulding sands.

UNIVERSITY OF BIRMINGHAM.

Organised by Professor T. Turner.

Specimens illustrating Professor Turner's researches on Silicon in cast iron, in 1885.

Researches on the *Magnetic Properties* of Cast Iron, by Mr. J. H. Partridge, B.Sc. Researches on the Density and Brittle Ranges of Brass and Bronze by Messrs. Bamford, Bunting, Heape and Kent.

XUM

VEREIN DEUTSCHER EISENGIESSEREIN GIESSEREIVERBAND.

(German Foundry Owners' Association.)

Organised by Dr. Geilenkirchen.

Right and Wrong Design of Castings.—*Shown* by diagrams, models and castings.

Exhibit of the methods of organising the *flow of work* in a foundry, both for "stationary" and "continuous flow" foundries.

Costing and Statistics.—Principles and methods. *Time Studies.*

Foundry Design and Outlay.—160 charts of various iron, steel and malleable foundries.

Cupola Design.—30 charts illustrating development in cupola design and one model.

Cupola Charging.—Set of charts and two models illustrating cupola charging methods (mechanical and hand).

Cupola Lining.—Charts and three models.

Cupola Combustion and Melting Process.—Five charts of combustion zone; five charts of melting zone; one chart of desulphurising system; and glass cylinder models illustrating charge descent and separation of various mixtures.

Air Furnaces.—Series of charts and models illustrating the development of air furnaces in Germany, England, America, during the last 100 years.

BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION

71, Temple Row, Birmingham.

Organised by Dr. R. S. Hutton.

Exhibit of Die-Casting Alloys, Research, Etc.

Specimens, models and diagrams to illustrate Researches carried out for the Association at the following Institutions:—(1) National Physical Laboratory; (2) the Research Department, Woolwich; and (3) Sheffield University. The object of these researches has been to demonstrate the strength and other properties of die-castings made with available alloys; to explore and introduce alloys with improved properties; and to investigate mould materials and other problems connected with the process of die-casting.

SCIENTIFIC APPARATUS.

Organised by Mr. Wesley Lambert.

(1) Mould Hardness Tester, and (2) Frémont Testing Machine (lent by Universal System of Machine Moulding and Machinery Company, Limited, Queen Victoria Street).

(3) "Service" Metallurgical Microscope with auxiliary apparatus (lent by W. Watson & Sons, Limited, High Holborn).

(4) Continuous Type Temperature Recorder, and (5) Portable Temperature Indicator and auxiliary apparatus (lent by Siemens Brothers & Co., Ltd., Westminster).

(6) Auto-Temperature Regulators, and (7) CO_2 determination apparatus (lent by Sarco Engineering and Trading Company, Limited).

(8) Auto-punch and Reading Microscope (lent by Rudge-Whitworth, Limited, of Birmingham).

(9) Brinell Hardness Testing Machine and (10) Contraction and Chill Apparatus (lent by J. W. Jackman & Company, Limited, of London and Manchester).

(11) Brinell Crater Microscope and (12) Stereoscopic Microscope with auxiliary apparatus (lent by Ogilvy & Company, 30, Mortimer Street, W.1).

(13) Repeated Impact Testing Machine; (14) Cambridge Extensometer, and (15) Rosenhain Calorimeter (lent by the Cambridge Instrument Company, Limited, 45, Grosvenor Place, S.W.1).

(16) Wanner Optical Pyrometer; (17) Radiation Pyrometer, and (18) Insertion Pyrometer (lent by Bowen Instrument Company, of Leeds).

(19) Photomicrographic Camera, with auxiliary apparatus, and (20) Radial Metallurgical Microscope (lent by R. & J. Beck, 69, Mortimer Street, W.1).

(21) Photomicrographic Apparatus, with auxiliary apparatus; (22) Metallurgical Microscope; (23) Brinell Impression Microscope, and (24) Binocular Microscope (lent by C. Baker, 244, High Holborn, W.C.1).

(25) Scleroscope (lent by Coats Machine Tool Company, Limited, 14, Palmer Street, S.W.1).

(26) Metalworks Camera (lent by F. Davidson & Company, 29, Great Portland Street, W.1).

(27) Humphrey Autographic Testing Machine; (28) Optical Pyrometer; and (29) Immersion Type Pyrometer (lent by the Foster Instrument Company, Limited, of Letchworth).

(30) Bar Tester and (31) Hardness Tester (lent by W. & T. Avery, Limited, of Birmingham).

(32) Set of Micro-photographs demonstrating a new process (lent by D. & J. Tallis, Ironfounders, Clydebank.

BRITISH CAST-IRON RESEARCH ASSOCIATION,

Central House, New Street, Birmingham.

Organised by Mr. J. G. Pearce.

Pig-iron.—Various samples of pig-iron illustrating the difficulty of relating fracture and analysis. Samples of pig-iron correctly and incorrectly sampled, with analyses attached showing errors due to incorrect sampling.

Grey Iron.—Samples and photomicrographs of various grey iron castings illustrating good castings and defects, special methods of moulding, etc.

Malleable Castings.—A range of typical malleable castings and photomicrographs.

Microscopy.—A metallurgical microscope with prepared samples for examination. The samples in general will be illustrative of other sections of the exhibit.

Moulding Sands.—Samples of several representative British moulding sands, with grading results by elutriation and sedimentation methods, accompanied by micrographs and slides. A petrological microscope, an elutriation apparatus and test bars used for wet and dry transverse, and for compression tests.

Corrosion Tests.—Tap water and acid corrosion tests in progress, with curves comparing the behaviour of various types of cast iron and other material under these tests.

Thermal Analysis.—A Chevenard Thermal Analyser in operation with curves prepared from recent tests on heat-resisting cast irons.

TYPICAL CASTINGS.

Organised by Mr. R. J. Shaw.

A selection of typical castings are shown together with their runners and risers in place. Amongst the contributing foundries are Messrs. Fraser & Chalmers (branch of the General Electric Company, Limited) and the Ealing Park Foundry.

PIG-IRON.

Organised by Mr. H. Shillitoe.

This exhibit comprises a range of standard and typical qualities of pig-irons emanating from most of the smelting districts of Great Britain, together with their average approximate analyses.

Handling Plant at the Exhibition.

One of the most interesting sights during the preparation of the Exhibition for the opening, was to see Messrs. Pickfords, Limited, of 151, Tower Bridge Road, London, 2½-ton and 5-ton cranes at work, which are specially adapted for the rapid handling of weights in confined spaces.

Since Messrs. Pickfords, Limited, undertook exhibition lifting work a few months ago, they have had to purchase an additional crane to meet the demand for their services, which include lifting off the vehicle, sometimes outside the hall, travelling with the load and placing it in position on the stand. Erecting can also be carried out with a great saving of time and expense, the old-fashioned shear legs being entirely superseded.

It is noteworthy that amongst many exhibits handled of a fragile and delicate nature, perhaps the most outstanding is that of Messrs. The Fordath Engineering Company, Limited, who are showing a sand core weighing 2½-tons; this was first lifted off the lorry in a case, then unpacked, and the bare mould lifted without damage out of the case and on to the stand.

This new departure in the firm's work, added to its vast transport organisation, extending into all parts of the world, and dating from 1777, ensures its continued position as the premier transport undertaking.

Messrs. Pickfords, Limited, keep a staff specially to deal with awkward and heavy pieces of machinery, such as are to be identified with foundry work.

MACNAB & CO.

BRITISH MANUFACTURE THROUGHOUT

Tabor Patent Portable Combination "Shockless" Jarring Roll-over and Pattern-Drawing

MOULDING MACHINE.

PIONEERS FOR 40 YEARS

THE TABOR RANGE OF MOULDING MACHINES Combine THE WELL-KNOWN TABOR QUALITIES

The Finished Mould—showing Pattern after being drawn.

FLEXIBILITY—ECONOMY—SPEED

DURABILITY & EFFICIENCY

CAPACITY.

SIZE	*Size of Moulding Box.	Straight Pattern Draft.	Nett Weight of load that can be rolled over at 80lbs. pressure.
18	18 in. wide 36 in. long 12 in. deep	8/10 in.	450 lbs.
24	24 in. wide 48 in. long 15 in. deep	10/12 in.	800 lbs.

Special Features and Advantages.

Sand jar rammed by "Shockless" device—Tabor Patent—without shock to the machine or surrounding moulds.

***Machine not restricted to use of one size moulding box—any size can be used up to load capacity of machine.**

Good surface castings.

Pattern plates can be changed instantly without unfastening mechanism so that comparatively small quantities can be made economically.

Perfectly straight draw ensured by mechanical guides of large surface to prevent wear and retain accuracy.

All moulds jar rammed in a few seconds and thoroughly uniform in density, ensuring minimum quantity of defective castings and less blow holes.

All operations other than sand filling are completed in two minutes for any size of work within capacity of machine. To realise what this means, compare your present wage cost for the same work!

We make various models and sizes for all types of machine moulding, according to class of work and numbers.

SEND US DRAWINGS OF YOUR WORK FOR SPECIFIC EXPERT ADVICE,
:: :: ACCORDING TO YOUR CONDITIONS AND QUANTITIES

56/8, EAGLE ST., SOUTHAMPTON ROW, LONDON, W.C.1.

WORKS: TOTTENHAM, LONDON, N.17.

Code: Western Union.

Iron-Foundry Costing.

By F. H. and L. W. B.

Undoubtedly great assistance would be derived by all foundries if an efficient costing system were nationally established which would prevail under any circumstances. Many firms, particularly those engaged upon work which is general and varied, experience great difficulty in arriving at proper and accurate costs, and numerous attempts have been made to install systems which have eventually proved failures.

From a national point of view one of the greatest enemies to the foundry is the "one-man concern," possessing a few moulders and no ideals as to progression. Unfortunately, firms of this description are often placed in exceptional circumstances owing to the fact that there are no standing charges of any great account; probably these have long since been cleared off, according to the length of time the business has been established. This fact allows castings to be sold at a very cheap rate that often eventually becomes a recognised standard, which places foundries with standing charges to face, at a disadvantage. A method of combating this would be to swarm firms of this description out with orders, and thus either force them to refuse work or extend, which would automatically bring them into line with the larger foundries.

Realising all the difficulties of the situation, we propose to describe, with examples, a system which has been prepared and worked for a considerable period. Once the system is installed, no matter how precise any firm, whether engaged on repeat or general work, requires its costing to be, the information can be obtained in a few moments. Additionally, an advantage would be gained if daily or weekly output sheets be incorporated, which show the actual cost of each casting and the amount of profit or loss made thereon. So accurate are these returns, it would only be a matter of moments to show the profit or loss of the business at any period, which in itself is a great asset. Also, the amount of metal used could be accurately checked to see that no unnecessary waste was taking place; stocks could be arrived at easily, and the whole records kept in a concise and businesslike manner.

Regarding the price list, it should be fully understood that the number of moulding hours shown for each weight relate only to general work castings. What really ought to be done is for each casting, whatever its weight, to be costed and charged separately. Why should two castings of equal weight be sold at the same rate per cwt. when such facts have to be considered? Ridiculous as this may appear, it represents the state of affairs to-day, and this accounts for a large portion of the loss sustained, particularly upon light work. However, customers apparently prefer to buy castings by the cwt.; therefore their needs must be satisfied, and yet the foundryman must protect himself. This can be accomplished by using this system and taking the number of moulding hours given to be a reasonable average as explained. To obtain the price for a special job, the number of moulding hours must be established, when it would be a simple matter to adjust the price per cwt.

Perhaps it is necessary here to explain why we only consider the moulding time. Our reasons are mainly that to prevent any overlapping of the standing charges it is necessary to obtain a single unit figure; further, the moulder is actually the producer. Coremakers, dressers, labourers, and cupolamen really assist the moulder to perform the work; therefore why should their time be sectionised separately? No one would think of charging separately on each job the time of the foreman or clerk, but each assists to get out the work similarly to the coremakers and dressers, and in some cases that could be quoted the foreman is known to spend 90 per cent. of the time upon particular jobs, and probably the amount of labour differs as much in the one case as the other. The only stipulation made is that the management of the foundry must not expect to turn out all work that necessitates a lot of coremaking, but must have a fair proportion of small and large cored jobs, then all is satisfactory. Therefore, to obtain this single unit figure, the coremakers', dressers', etc., time is included over the total, and this figure, providing the standing charges are in accordance with the figure supplied, pay for all charges against the business according to the number of moulding hours engaged. Below an example of the daily or weekly output sheet is shown for the 2 cwt. 2 qrs. casting previously explained, and probably from this the method will be followed. The single unit figure for this purpose works out at 4s. 3½d. from the chart.

Selling price.	Job No.	No. off.	Description of casting.	Weight.	Cost of metal.	No. of moulding hours.	Single unit figure.	Absolute inclusive nett cost to foundry.
				c. q. lb.	s. d.		s. d.	£ s. d.
Plus say 10 per cent. on cost ..	—	1	Casting ..	2 2 0	13 4	8	4 3½	2 7 8
Do. do. ..	—	1	Casting ..	2 2 0	13 4	4	4 3½	1 10 6

moulded with loose patterns. Owing to the many different types of castings it is impossible to create a definite ruling and say that all castings of equal weight must take the same number of hours to mould. Therefore, to surmount this difficulty a chart has been prepared, an example of which is printed overleaf. The basis of compiling has been to obtain the amount of moulding time needed to make an average casting for each particular weight. These figures have been arrived at by making calculations over a number of years, and the number of hours given are quite ample to allow for the moulding of any ordinary casting with normal amount of cores. Should the cost be required for an abnormal casting, allowance must be made and the price per cwt. altered accordingly. Take for example a casting weighing 2 cwts. 2 qrs., the chart says the hours required for moulding are 6.2. Any ordinary casting will be moulded in this time, yet it is quite possible for a casting of this weight to take eight hours to mould; or, on the other hand, only four hours may be necessary, according to the difficult or easy nature of the work. This fact only goes to show the fallacy of trying to obtain a system to work collectively on the cwt. basis of selling

The system could be made national, and is applicable to any size of foundry, either by compiling an explanatory book or establishing an office for the purpose of supplying all the necessary figures and explanations.

One of the most important points regarding systems centres round standing charges and the method by which these are applied, and knowing what to include and exclude therein. This fact alone makes this or any other system a success or a failure, and no one, as yet, appears to have satisfactorily solved this problem. This system is workable under any circumstances, and the methods used have so far proved entirely successful. The fault with most foundry systems is that they have been found impossible to work without any overlapping of the standing charges, and the large amount of book matter and red tape involved. This system overcomes these difficulties, and for the purpose of keeping all books and records one clerk and one typist would suffice in any firm up to 15 moulders.

Using as an example a firm of nine moulders, it has been found that the maximum amount of standing charges allowable weekly, to

(*Continued on page 432.*)

THE ABOVE IS A PHOTOGRAPH OF A TEST PIECE BENT COLD FROM THE FLAT.

LEY'S "BLACKHEART" MALLEABLE IRON CASTINGS

DO YOU KNOW The easy machining qualities of these castings ?

DO YOU KNOW The tensile strength is 22 to 26 Tons per square Inch ?

DO YOU KNOW The average elongation in three inches is 14·5 per cent. ?

DO YOU KNOW These are the finest Malleable Castings produced in this Country for Automobile and General Engineering work ?

Works cover 30 Acres and are devoted solely to the production of "Blackheart" Malleable Iron

For further particulars apply to

LEY'S MALLEABLE CASTINGS CO., LTD.
VULCAN IRON WORKS, DERBY

REGD. TRADE MARKS:
"BLACKHEART" &

Telephone Nos. 896/7
Telegrams: "LEY'S DERBY"

(*Continued from page* 430.)

run such a business efficiently and competitively, should not exceed £46 6s. So long as this was adhered to and conditions were as set out, the prices given by the chart would prevail. Once the system was fully understood it would be a simple matter to arrive at this maximum figure for any size of firm, under all conditions such as alterations in wages, etc., and a fixed figure of this description would immediately provide a sound casting basis.

So important is this matter of standing charges, there must of necessity be a limit, and everyone, if they desire to be successful in business, must know where this limit ends, and take steps to conform with it. Should standing charges be too heavy, they must be reduced, or losses and perhaps insolvency will soon follow. The standing charges allowable by this system will usually be found ample to run the business.

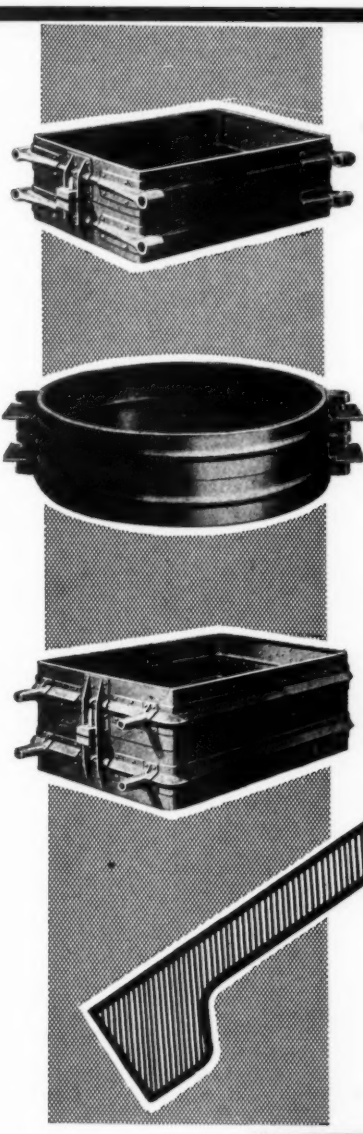
(*Continued on page* 434.)

ANALYSES OF FOUNDRY COSTS.

	£ s. d.		£ s. d.
9 moulders	28 7 0		4 13 6
2 apprentices	2 4 0	All	4 6 0
1 core maker	3 3 0	47 hrs.	4 2 0
1 crane driver	2 10 0	per	2 7 0
1 furnace-man	2 5 0	week	
2 dressers	4 15 0		
1 labourer	2 3 0		
	45 7 0		
Maximum standing and working charges ..	46 6 0		
Total outlay	£91 13 0		

		£ s. d.
Hematite	30%	1 8 0
Pig-iron (mixed)	20%	0 17 3
Scrap	50%	2 1 0
Coke	4 cwts. ..	0 9 5
Limestone	.. .. ..	0 1 0
		4 16 8
Waste	5%	0 4 10
		5 1 6
Interest	5%	0 5 1
Per ton	.. .. ..	£5 6 7
Per cwt.	.. .. ..	0 5 4

From.				To					General work. Loose Patts.	Cost per cwt. including metal at 93% efficiency.	Cost per cwt. including metal plate moulding
T.	Cwts.	Qrs.	Lbs.	T.	Cwts.	Qrs.	Lbs.	×	Hrs.	£ s. d.	s d.
0	0	0	7	0	0	0	14	55	1	1 19 6	16 8
0	0	0	14	0	0	1	0	74	1.5	1 11 1	14 0
0	0	1	0	0	0	2	0	92	2.4	1 5 11½	14 0
0	0	2	0	0	0	3	0	110	3	1 2 6	13 11
0	0	3	0	0	1	0	0	128	3.5	1 0 4½	12 10
0	1	0	0	0	1	2	0	146	4.5	0 18 2½	11 7
0	1	2	0	0	2	0	0	164	5.4	0 16 11½	11 1¼
0	2	0	0	0	2	2	0	182	6.2	0 16 0	10 8
0	2	2	0	0	3	0	0	210	6.4	0 14 6	9 11
0	3	0	0	0	3	2	0	228	6.8	0 13 8	9 6
0	3	2	0	0	4	0	0	250	7.1	0 12 11½	
0	4	0	0	0	4	2	0	249	8	0 13 0¼	
0	4	2	0	0	5	0	0	248	9	0 13 0¾	
0	5	0	0	0	5	2	0	247	9.9	0 13 1	
0	5	2	0	0	6	0	0	246	10.9	0 13 1¾	
0	6	0	0	0	6	2	0	245	11.8	0 13 1¾	
0	6	2	0	0	7	0	0	244	12.8	0 13 2¼	
0	7	0	0	0	7	2	0	243	13.8	0 13 3	
0	7	2	0	0	8	0	0	242	14.8	0 13 3½	
0	8	0	0	0	8	2	0	241	15.8	0 13 4	
0	8	2	0	0	9	0	0	240	16.8	0 13 4¼	
0	9	0	0	0	9	2	0	239	17.8	0 13 4½	
0	9	2	0	0	10	0	0	238	18.8	0 13 4¾	
0	10	0	0	0	10	2	0	237	19.8	0 13 5¼	
0	10	2	0	0	11	0	0	236	20.8	0 13 5½	
0	11	0	0	0	11	2	0	235	21.9	0 13 6	
0	11	2	0	0	12	0	0	234	22.9	0 13 6¼	
0	12	0	0	0	12	2	0	233	24	0 13 7	
0	12	2	0	0	13	0	0	232	25.1	0 13 7½	
0	13	0	0	0	13	2	0	231	26.1	0 13 7¾	
0	13	2	0	0	14	0	0	230	27.2	0 13 8	
0	14	0	0	0	14	2	0	229	28.4	0 13 9	
0	14	2	0	0	15	0	0	228	29.4	0 13 9	
0	15	0	0	0	15	2	0	227	30.5	0 13 9½	
0	15	2	0	0	16	0	0	226	31.7	0 13 10	
0	16	0	0	0	16	2	0	225	32.8	0 13 10¼	
0	16	2	0	0	17	0	0	224	34	0 13 11	
0	17	0	0	0	17	2	0	223	35.1	0 13 11½	
0	17	2	0	0	18	0	0	222	36.2	0 13 11¾	
0	18	0	0	0	18	2	0	221	37.5	0 14 0	
0	18	2	0	0	19	0	0	220	38.2	0 13 11¾	
0	19	0	0	0	19	2	0	219	39.7	0 14 0¾	
0	19	2	0	1	0	0	0	218	41.1	0 14 2	
1	0	0	0	1	10	0	0	217	61.9	0 14 2¼	
1	10	0	0	2	0	0	0	216	82.5	0 14 2¼	
LOAM MOULDING.											
0	5	0	0	0	10	0	0	130	34.4	1 0 3½	
0	10	0	0	1	0	0	0	140	64.0	0 19 0¾	
1	0	0	0	1	10	0	0	150	84.6	0 18 1¾	
1	10	0	0	2	0	0	0	160	112.0	0 17 4½	
OPEN SAND MOULDING											
0	2	2	0	0	5	0	0	1,000	2.2	0 7 3	
0	5	0	0	0	10	0	0	1,500	2.9	0 6 7	
0	10	0	0	1	0	0	0	2,000	4.4	0 6 7	



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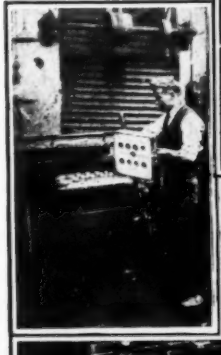

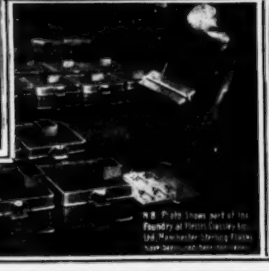

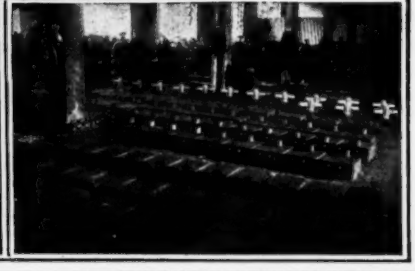

FOUNDRY EXHIBITION
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JUNE 10th—19th
OUR STAND IS No. 4, ROW D.

STERLING FOUNDRY SPECIALTIES Ltd., BEDFORD

London Office: 13, VICTORIA STREET, S.W.1

(*Continued from page* 432.)

Notes and Explanations.

The figure given for maximum standing charges includes all expenses that the foundry is called upon to bear, and is comprised of management salaries, State insurance, sand, utensils, running expenses, repairs, property tax, rates, insurance, ground rent, gas, water, electricity, motor expenses, office and advertising expenses, travellers' expenses, and depreciation.

Included in the cost of the metal is an allowance of 5 per cent. for loss in melting. Also, in this figure is a further allowance of 5 per cent. interest. This has been allowed as a contingency against running a business with a bank overdraft. Therefore, if it be decided that a profit of 10 per cent. be added to the cost figures, the ultimate profit for a firm working without overdraft will be 15 per cent., while for a firm using an overdraft the profit will be the bare 10 per cent. From this ultimate profit will have to be paid income tax and dividend on shares, or the profits shared between the partners. The above contingency is purely optional.

The figures in column marked "X" represent key figures, from which the moulding hours are established.

Foundries cannot work on 100 per cent. efficiency. On the average time lost is 7 per cent. on the total, roughly 3½ per cent. on wasters and 3½ per cent. through sickness. Therefore, an allowance has been made for this in the cost price.

If these figures are compared with the ones previously quoted, a slight difference will be noted. This is accounted for by the fact that the figures have now been brought up to date.

Since compiling this article, we have noticed a report in THE FOUNDRY TRADE JOURNAL, dated March 18, 1926, of a Paper upon foundry costing. In the course of this Paper figures which we have previously supplied are quoted, and it is remarked that these figures are probably not applicable to certain cases, such as automobile work. We wish to take the opportunity of saying that, no matter whether the foundry is engaged on automobile work, or any other class of foundry work, our figures are applicable in each and every case. Perhaps, after reading the article, it will be noticed that we do not say that castings of equal weight should be sold at the same rate per cwt.

Regarding the system referred to, and whilst appreciating the efforts, it is rather disappointing to find that no figures are supplied that can be contested. Further, it seems that the methods used are rather complicated, and it is thought that, if the opportunity were offered, overlapping could be traced.

A Few More Exhibits.

The following exhibits were not included in the general list owing to transport difficulties. They were well forward yesterday, and will be completely ready in time for the opening of the Exhibition this morning.

THE BLACKFRIARS FOUNDRY REQUISITE COMPANY, LIMITED

34/35, Norfolk Street, London, W.C.2.

This firm is showing various materials and requisites of every description for foundry use, such as various grades of coal dust and blackings, which are manufactured by J. & J. Dyson, Limited (Sheffield, Chesterfield and Stannington). This coal dust is made from selected Yorkshire coal, highly volatile and low in ash. Other materials coming from Dyson's are Sheffield ground ganisters, fireclay goods, such as nozzles, runners, stoppers. Kent moulding sand from the Lower Upnor Quarries, Rochester, is another exhibit of refractory materials. A new speciality is "Stripoline" parting powder, which is particularly suitable for metal plate work, whilst an old one is "Glutrin," the well-established core binder. Pressed steel moulding boxes have long been a speciality of this firm, and a large selection is being shown, together with a number of foundry requisites, such as sieves, shovels, bellows, etc.

Mr. F. J. Barraball and Mr. A. L. Wells are in charge of the stand.

THE CONSTRUCTIONAL ENGINEERING COMPANY.

Titan Works, Birmingham.

No exhibit of this concern would be complete without one of their well-known cupolas. They have chosen the largest size possible (36 in.) which could be transported by road. The features of Titan cupolas are well known. Two sizes of cupolettes are shown, the utility of which is generally appreciated by small foundries as a commercial melting unit and by large firms as an experimental plant. Ladles, shanks, and tongs are well covered by numerous exhibits. During the last few months a mechanical riddle has been developed, and this is also to be shown. The Campion blast meter, a relatively new development, is also shown. Much other foundry equipment constitutes what is one of the most interesting stands in the show. Mr. D. H. Wood, assisted by Mr. Turner, is taking charge of the stand.

THE CONSOLIDATED PNEUMATIC TOOL COMPANY, LIMITED.

170, *Piccadilly, London*, W.1.

This firm is showing all kinds of pneumatic appliances for foundry work. There are shown in operation the following pneumatic tools: Sand rammers, sand sifters, fettling chippers, core breakers, grinders, and hoists. In the yard they have a portable air compressor and a stationary one on the stand. Additionally they show a full line of welding machines suitable for foundry use. Mr. F. A. Wright and Mr. H. H. Wood are in charge of the stand.

SPERMOLIN, LIMITED.

Halifax.

This old-established firm of core-oil manufacturers are showing 4- and 6-cylinder automobile engine cores and castings made with Spermolin. Two machines are shown, one of which is of robust construction and is cast in high percentage semi-steel. All gears are machine cut and adequately guarded and outside sand-proof bearings are fitted. There are no "beaters" or "arms" which are liable to cause injury to the workmen, and the machine completely empties itself without the necessity of tilting. The machine consists of two shafts fitted with twelve blades and one thrower on each, working in two troughs. These blades not only mix the sand but actually mill it, the throwers delivering the sand from one trough to the other. The blades are mounted loose on a square shaft which can easily be withdrawn to facilitate the renewal of a damaged blade should this be necessary.

The second machine is the Spermolin rotary core machine, of which the special feature is a patent rising and falling tray carrier which instantly adjusts the tray to the exact level and parallel with the die, thus obviating the necessity of packing up the tray and eliminating bent and distorted cores. The hopper and tray carrier are mounted on a neat, strong cast-iron base, making the machine complete in one piece with perfect alignment throughout. The dies and conveyors are ground, polished, tested and guaranteed accurate.

The standard machine produces one core sufficiently vented any diameter—rising in eighths from ½ in. to 2½ in. diameter and 24 in. long in half a minute.

Standard Pattern Chart.

The American Foundrymen's Association have published a pattern colour chart which has been adopted by their Joint Committee on Pattern Equipment Standardisation. This chart embodies the standard markings approved by the A.F.A. and the cooperating societies. They can be had at a cost of 10 cents, plus postage, from Mr. C. E. Hoyt, 140, South Dearborn Street, Chicago.

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HIGH GRADE HEMATITE
PIG IRON
FOR
FOUNDRY
AND OTHER PURPOSES

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SIEMENS-MARTIN
(ACID PROCESS).

MILD STEEL PLATES
(Ship and Boiler Quality).

CHEQUERED PLATES
(Ordinary and Admiralty Diamond Patterns).

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Also Manufacturers of
GOOD FOUNDRY COKE
SILICA BRICKS
FIRECLAY BRICKS
&c., &c.

Trade Talk.

THE MAGNESIUM COMPANY, LIMITED, have removed to Point Pleasant, Wandsworth, London, S.W.18.

A FIRE, which was not attended by serious damage, occurred at Beach, Hill & Company's foundry, Guns Lane, West Bromwich, last week-end.

COX & DANKS, LIMITED, Warehouse and Scrap Depôt, Cradley Heath, Staffs., announce that R. Green, Limited, have not been connected with them for the past twelve months.

THE CONTRACT for the erection of the steelwork at the Michelin Tyre Company's new site at Stoke-on-Trent has been secured by Edward Wood & Company, Limited, Ocean Iron Works, Manchester.

JAMES GORDON & COMPANY, LIMITED, Windsor House, Kingsway, London, W.C.2, have received orders during May for 50 sets of Copes feed water regulators for super power stations, a record month.

PLANS for a scheme of various types of steel houses to be erected at Sandyhills by the Second Scottish National Company have been passed at the Glasgow Dean of Guild Court. They show 464 dwellings of 3 and 4 apartments, composed of 200 Cowieson cottages in 50 groups, 148 houses in Atholl flats, 443 Weir houses in 11 groups, and 36 pairs of Weir-Douglas type, embracing 72 houses. The cost is estimated at considerably over £300,000.

ORDERS FOR 13,000 tons of steel rails have been placed by the London and North-Eastern Railway Company with Bolckow, Vaughan & Company, Limited, Pease & Partners, Limited, Cargo Fleet Iron Company, Limited, Barrow Hematite Steel Company, Limited, and Steel, Peech & Tozer, Limited. The London and North-Eastern Railway have also placed orders with the following firms for a total of 4,400 pairs of wagon wheels and axles :—Leeds Wheel & Axle Company, Leeds; Owen Dyson, Rotherham; J. Baker & Company, Rotherham; Taylor Bros. & Company, Manchester; Motherwell Wagon & Rolling Stock Company, Motherwell; Midland Railway Carriage & Wagon Company, Birmingham; Pearson & Knowles Coal & Iron Company, Warrington; William Beardmore & Company, Limited, Glasgow, and Cravens Railway Carriage & Wagon Company, Sheffield.

New Companies.

Abbey Foundry, Limited, Abbey Foundry, Whalley.—Capital £500 in £1 shares. Directors: W. Dean and C. T. Eddlestone.

E. Ayers & Company, Limited, Forth Banks West Factory, Pottery Lane, Newcastle-upon-Tyne.—Capital £20,000 in £1 shares, to acquire business of engineers and ironfounders carried on by J. & G. Joicey & Company, at Newcastle-upon Tyne. Directors: E. Ayers, 87, Kenton Road, Newcastle-upon-Tyne; A. Gilhespy, 218, Wingrove Avenue, Newcastle-upon-Tyne.

Foundry Supply Company, Limited.—Capital £5,000 in £1 shares. Directors: R. H. Nichols; H. Todd, 26, Rockcliffe Road, Middlesbrough; and Mrs. Mary A. Todd, 26, Rockcliffe Road, Middlesbrough.

H. Yeoman Evans, Limited, 23, Buckingham Street, Adelphi, London, W.C.1.—Capital £6,000 in £1 shares. Engineers. Directors: H. Yeoman Evans and J. T. Horrocks.

International Foundry Equipment Company, Limited, 132, Steelhouse Lane, Birmingham.—Capital £500 in £1 shares. Directors: G. C. Castle and P. Cozens.

Limel Le Sueur & Company, Limited, 25, Monument Street, E.C.—Capital £500 in 250 7 per cent. preference shares of £1 each and 5,000 ordinary shares of 1s. each. Ironfounders. Directors: L. Le Sueur and Mrs. L. Le Sueur.

Mirrlees Watson Company, Limited, 45, Scotland Street, Glasgow.—Capital £100 in £1 shares. Mechanical, electrical, hydraulic and marine engineers. Directors: A. F. Baird, 124, St. Vincent Street, Glasgow; C. Day, Highfield, Mile End, Stockport; H. N. Bickerton, Thoneycroft Hall, Siddington, Cheshire; C. Ker, Easterton, Milngavie, Glasgow; A. Lamberton, Blairtummock, Easterhouse, near Glasgow; W. S. Herriott, 12, Woodrow Road, Pollokshields; and W. A. Dexter, 7, Knowe Terrace, Shields Roads, Pollokshields, Glasgow.

White's Engineering Company (Pendleton), Limited.—Capital £10,000 in £1 shares. Directors: Sir Thomas Smethurst, Pall Mall, Manchester; F. Hardwick, Grange Close, Ripon; H. Wilde, 80, Cambridge Road, Southport; and R. Parkes, 22, Moorfield Road, Pendleton, Manchester.

William Harper, Son & Company (Willenhall), Limited,—Capital £30,000 in £1 shares. Ironfounders. Directors: J. A. Harper, Eastlea, Bilston Lane, Willenhall; J. J. Harper, Allendale, The Manor, Willenhall, Staffs., and W. G. Harper, "Accolon," Elm Street, Bilston, and two others.

Contracts Open.

Warrington, June 12.—(3) Castings; (14) iron and steel; (22) steel or cast mains; (28) wrought iron tubes and fittings; for Gas Committee. Mr. A. Cook, engineer and manager, Warrington.

Droitwich, June 12.—(1) Cast-iron pipes and specials; (2) laying new 10-in., 8-in. and 6-in. cast-iron gas mains; (3) supply and erection of vertical boiler, for Droitwich Corporation. The Town Clerk, Town Hall, Droitwich.

Stockton-on-Tees, June 12.—(4) Bolts and nuts; (5) castings; (7) cast-iron spigot and socket pipes; (10) wrought-iron tubing; (11) gas meters, for the Corporation. Mr. W. W. Atley, engineer and general manager, Corporation Gasworks, Thompson Street, Stockton-on-Tees.

Penpont, Dumfries, June 15.—198 lineal yds. of 2-in. cast-iron pipes, together with all special castings, valves, and other fittings, and the transfer of the existing house connections to the new main, for the Thornhill District Committee. Mr. W. C. Faston, chartered civil engineer, 183, West George Street, Glasgow, C.2. (Fee, 10s. 6d., returnable.)

Personal.

FIVE OF THE PRINCIPAL DIRECTORS of Sir W. G. Armstrong, Whitworth & Company, Limited, including Sir Glynn H. West, the chairman, have resigned. The other four are Mr. J. M. Faulkner, the Right Hon. Sir George Murray, Sir C. L. Ottley, and Lord Sydenham. The remainder of the board, with the addition of Mr. J. Frater Taylor, has been reconstructed. The new chairman is Lord Southborough, the other well-known names still associated with the firm being those of Sir John Brunel Noble, Mr. A. H. J. Cochrane, Sir George Hadcock, Major Charles Mitchell, Mr. Saxton Noble, and Sir Eustace Tennyson-d'Eyncourt.

MR. WALTER BUTTERWORTH, M.A., J.P., was elected President of the Society of Glass Technology at the annual meeting of the Society recently held at the Sheffield University. Mr. Butterworth is a member of the Executive Committee of the Glass Research Delegacy and managing director of Butterworth Bros., Limited, makers of all kinds of glass for mechanical, scientific and industrial purposes, who were founded in 1863. The Society of Glass Technology has a membership of between 600 and 700, including the largest manufacturers of glass in this country, and the more important firms in eighteen different foreign countries, among which are Japan, Peru, Hungary, Spain and the United States.

Wills.

SELLMAN, G. H., Wolverhampton, founder of the firm of Sellman & Hill, sheet metal workers	£14,872
BERRY, G., Cowley, near Uxbridge, manager of the British Electric Transformer Company, Limited	£10,813
RICHARDS, F. J., of East Lynne, Chepstow Road, Newport, Mon., for many years connected with the iron and steel trade	£8,803

Obituary.

MR. P. CARLISLE died at his residence, in Riverdale Road, Sheffield, recently, at the age of 67. He was head of the firm of Lockwood & Carlisle, engineers, of Sheffield.

MR. F. HARRISON, who died recently at the age of 58, was works manager at the Thorncliffe Iron Works, belonging to Newton, Chambers & Company, Limited. Prior to going to Thorncliffe 15 years ago, Mr. Harrison was with the Holwell Iron Company at Melton Mowbray.

MR. KENNETH L. RITCHIE, a director of James & Ronald Ritchie, Limited, Acklam Foundry, Middlesbrough, died at Middlesbrough on May 26, after a brief illness. The deceased gentleman had charge of the commercial side of the business since his return in 1919 from active service, extending from 1914, in France, Mesopotamia and India.

AS A SLIGHT recognition of the loyalty and zeal of their workmen during the recent strike, Wailes Dove Bitumastic, Limited, have granted their men a day's holiday with full pay.

"RECENT DEVELOPMENTS IN ROLLING MILL MACHINERY" was the title of a lecture given recently by Mr. R. C. D. Fell to the members of the Sheffield Branch of the Junior Institution of Engineers. Mr. H. E. Yerbury (president) was in the chair.

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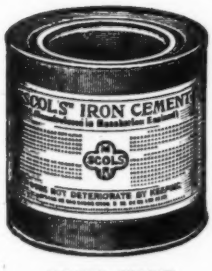

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IRON AND STEEL MARKETS.

Pig-Iron.

MIDDLESBROUGH.—With few apparent signs of an early termination of the dispute in the coalfields, the outlook in the Cleveland iron trade becomes more despondent, production having practically ceased, while markets are now entirely superfluous from a business point of view, and the urgent necessity of a prompt resumption of fuel supplies is a source of increasing anxiety. Not only is the home trade seriously affected, but export business is almost at a standstill, the statistics for May showing that the total shipments of pig-iron amounted to only 4,923 tons, of which 2,460 tons went abroad, and 2,473 tons coastwise. In April the total foreign shipments were 13,554 tons, and in March 20,006 tons. At this week's market only a few odd parcels changed hands ex stock to meet imperative needs. Prices, however, are firm and unchanged. No. 1 is 78s., No. 3 G.M.B. 75s., No. 4 foundry 74s., and No. 4 forge 73s. 6d. per ton. Export quotations are 6d. per ton more.

The hematite position on Tees-side is lifeless and unchanged, only a few small odd lots changing hands. East Coast mixed numbers are quoted at 78s. per ton, and the No. 1 quality at 78s. 6d. per ton. On the North-West Coast, despite the stagnant condition of trade, prices are firm at the old rates, with Bessemer mixed numbers quoted at £4 2s. 6d. c.i.f. Welsh ports, £4 5s. to £4 7s. 6d. per ton delivered at Glasgow, £4 8s. to £4 10s. per ton delivered at Sheffield, and £4 15s. per ton delivered at Birmingham.

LANCASHIRE.—In this area stocks of pig-iron are steadily being depleted, and more and more makers are withdrawing from the market. Some Derbyshire furnaces have been quoting 77s. 6d. per ton for No. 3 pig, including delivery into this area, which is about the same price as was given here a week ago. In other cases, however, ideas of selling prices are round 80s. For Scottish pig-iron, No. 3 quality, prices mentioned on 'Change last week were round 97s. 6d. per ton, delivered Manchester or equal.

THE MIDLANDS.—In South Staffordshire and the neighbouring districts all the furnaces are now out of action, and stocks of foundry pig in makers' yards have almost reached the vanishing point. It is, however, still possible to get limited supplies of Nos. 3 and 4 grades from Northants and Derbyshire. The price asked for Nos. 3 and 4 Derbyshire is round about 70s. at the furnaces, and Northants 66s. to 67s. per ton. Very few of the ironfounders seem to be in great difficulties for pig-iron, their chief anxiety being to get coke.

SCOTLAND.—As the stocks of foundry pig in hand are daily further diminished, the tendency of prices for Scotch iron becomes firmer, while consumers, recognising the difficulty of obtaining supplies, are now inclined to take a little more interest in the market, if only to a limited extent. No. 3 Scotch foundry is now quoted at 77s. per ton at the furnaces, while other brands not quite so plentiful stand at 1s. to 1s. 6d. more.

Finished Iron.

With the majority of manufacturing concerns crippled for lack of fuel, business in the various branches of finished material is necessarily restricted in volume. As far, however, as can be ascertained, there is no alteration in the price of various grades of iron; £14 at makers' works being the price for marked bars, £11 to £11 5s. delivered crown bars, with £9 15s. to £10 per ton for nut and bolt iron. As reported recently, it is possible to get supplies from one or two of the works still operating, but this concerns chiefly small sections. The bulk of the business for cheap iron is still being placed abroad, merely on account of the great disparity in price. No. 3 Belgian iron is quoted here at £5 15s. to £5 17s. 6d. per ton, showing a difference of approximately £4 per ton, and while these conditions obtain it is obvious that local mills, even when they get going, will have very little support.

Steel.

In the Sheffield market, business in both acid and basic billets is virtually suspended. The production of open-hearth steel is, to all intents and purposes, at a standstill, and more than thirty of the biggest furnaces in this district are now idle, while others are likely to close down within a very short time. Rolling mill operations are being more and more restricted. The foundries, being able to obtain fair supplies of coke, are able to keep going for the present. The tinplate market is in a quiet condition, although there are more orders about. A majority of the works is idle through lack of coal, and will remain so until the strike is settled. A little business has been done at much firmer prices.

Scrap.

In common with all other classes of raw material, the markets for scrap metal continue stagnant, with deliveries on standing contracts virtually suspended. The Midland foundries are still taking small quantities, but the prices in this instance vary considerably, 72s. 6d. per ton, delivered, being regarded as a fair average figure for heavy machinery cast-iron scrap, broken into cupola sizes, with light cast-iron quality at 62s. 6d. per ton, delivered.

Metals.

Copper.—The position in the market for standard copper has varied but very slightly during the past few weeks, and may be aptly described as steady to firm around a consistent level of £56 per ton. The current price being very low, there is no reason why fresh interest in the metal should not be attracted while the position is considered sound, and it remains to be seen whether, under the prospective control of about 90 per cent. of the total world's exports by the new organisation known as the Copper Export Trading Company, the market is not capable of being redeemed to an extent. Current quotations:—*Cash*: Thursday, £56 2s. 6d.; Friday, £56 2s. 6d.; Monday, £56 2s. 6d.; Tuesday, £56 5s.; Wednesday, £56 12s. 6d.

Three Months: Thursday, £57; Friday, £57; Monday, £57; Tuesday, £57 2s. 6d.; Wednesday, £57 10s.

Tin.—Movements in this section of the market have been naturally affected by the crisis in the mining industry, while American cable advices have also had a discouraging influence in depressing values. Home consumers are thus buying reluctantly, while speculative enterprise has been more or less kept in abeyance pending the clearing of the fuel troubles. The Continental demand generally has been spasmodic. The premium on spot tin, which had risen some time back to well over £10 a ton, has lately dwindled to a mere 30s. a ton. Current quotations:—*Cash*: Thursday, £263 15s.; Friday, £262; Monday, £261 5s.; Tuesday, £261 12s. 6d.; Wednesday, £265 15s.

Three Months: Thursday, £262 15s.; Friday, £260 10s.; Monday, £259 17s. 6d.; Tuesday, £260 10s.; Wednesday, £264 10s.

Spelter.—According to a trade circular, the metal has been quiet. After a firm opening, prices have eased off, with only small business resulting. Business, for obvious reasons, is still very restricted; consumers' demand has very naturally fallen off, and speculative interest, owing to the uncertain outlook, is reduced to a minimum, but the price, on the whole, holds very steady at round about the present level. Current quotations:—*Ordinary*: Thursday, £32 10s.; Friday, £32 10s.; Monday, £32 12s. 6d.; Tuesday, £32 18s. 9d.; Wednesday, £33 5s.

Lead.—In the market for soft foreign pig the home demand is fairly well sustained, while support has been encouraged somewhat by labour troubles in Australia; but there is still a large surplus available, and hence there is no particular reason to anticipate an early improvement. The best feature of the market has been the fact that Continental purchases have assumed greater importance. Current quotations:—*Soft foreign (prompt)*: Thursday, £29 8s. 9d.; Friday, £29 5s.; Monday, £29; Tuesday, £29 5s.; Wednesday, £29 12s. 6d.

Annual General Meeting and Congress of Chemists.—These are to be held in London, from July 19 to 23. The annual meeting will be the nucleus of a Congress of Chemists, in the arrangements for which the other Chemical Societies are co-operating with the Society of Chemical Industry. It is intended to invite representatives of foreign chemical societies. The enlargement of the scope of the meetings will, of course, entail a greater expenditure than usual, and the Executive Committee is confident that many of the members of the London Section and others will be glad to contribute what they can to this fund. The General Secretary's address is 46 and 47, Finsbury Square, London, E.C.2.

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BOILER, SHIP and BRIDGE PLATES, etc. ANGLES and all forms of Sectional Bars. TYRES and AXLES to all requirements. CASTINGS of all kinds and of Largest Sizes. FORGINGS of every description. BILLETS, BLOOMS, RAILS.

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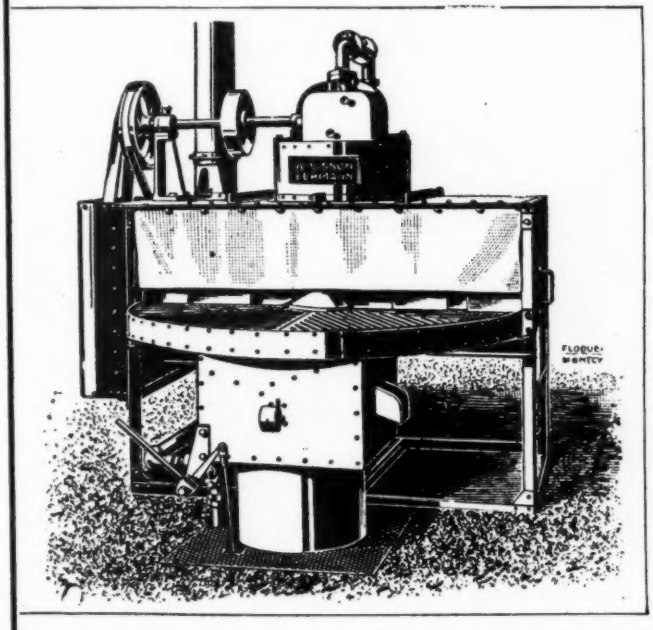
WHEN AT THE FOUNDRY TRADES EXHIBITION



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CLEANS 1,100 lbs.

of grey iron castings per hour with a single worker

COSTS LESS THAN YOU THINK—

ETABTS. A. SISSON-LEHMANN, STAND 11

Charleville, France. ROW F

GANISTER, CUPOLA BLOCKS, FIRE BRICKS, FIRE CLAY.

Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.

STEEL MOULDERS' COMPOSITION, SILICA CEMENT.

J. GRAYSON LOWOOD & Co., Ltd.

DEEPCAR, nr. SHEFFIELD.

Telegrams: "LOWOOD, DEEPCAR."

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash ..	56	12	6
Three months ..	57	10	0
Electrolytic	64	10	0
Tough	60	0	0
Best selected ..	60	10	0
Sheets	90	0	0
India	74	0	0
Wire bars	64	15	0
Do. June	64	10	0
Do. July	64	10	0
Ingot bars	64	7	6
H.C. wire rods ..	68	15	0
Off. av. cash, May	56	11	1½
Do., 3 mths. May	57	8	10½
Do., Sttlmnt, May	56	10	4½
Do., Electro, May	64	10	10½
Do., B.S., May ..	60	14	4½
Aver. spot price copper, May ..	56	10	4½
Do., wire bars, May	64	15	6
Solid drawn tubes		12¾d.	
Brazed tubes ..		12¾d.	
Wire		9½d.	

BRASS.

Solid drawn tubes ..	11¾d.
Brazed tubes	13¼d.
Rods, drawn	10¾d.
Rods, extd. or rlld. ..	7½d.
Sheets to 10 w.g ..	10¼d.
Wire	9¾d.
Rolled metal	9¾d.
Yellow metal rods ..	7½d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets ..	8½d.

TIN.

Standard cash ..	265	15	0
Three months ..	264	10	0
English	264	0	0
Bars	261	0	0
Straits	270	2	6
Australian	262	2	6
Eastern	265	5	0
Banca	264	2	6
Off.aver. cash, May	270	5	0¾
Do., 3 mths., May	266	14	5¼
Do., Sttlmt. May	270	4	9
Aver. spot., May	270	4	9

SPELTER.

Ordinary	33	5	0
Remelted	33	0	0
Hard	27	15	0
Electro 99.9 ..	36	5	0
English	33	12	6
India	30	15	0
Zinc dust	42	0	0
Zinc ashes	14	10	0
Off. aver., May ..	32	4	6
Aver., spot, May	32	0	9

LEAD.

Soft foreign ppt.	29	12	6
English	31	0	0
Off. average, May	28	9	8¾
Average spot, May	28	5	0

ZINC SHEETS, &c.

Zinc sheets, English	41	0	0
Do. V.M. ex whf.	38	0	0
Rods	44	0	0
Boiler plates ..	38	10	0
*Battery plates ..	38	0	0

ANTIMONY.

Special brands, Eng.	84	10	0
Chinese	60	0	0
Crude	40	0	0

QUICKSILVER.

Quicksilver ..	15	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon	
25%	£9 10 0
45/50%	£11 5 0
75%	£20 2 6
Ferro-vanadium—	
35/40% 14/6 to 15/3 lb. va.	
Ferro-molybdenum—	
70/75% c. free	6/3 lb.
Ferro-titanium—	
23/25% carbonless	11½d. lb.
Ferro-phosphorus, 20/25%,	£17 0 0
Ferro-tungsten—	
80/85%, c.fr. ..	1/7½ lb.
Tungsten metal powder—	
98/99%	2/1 lb.
Ferro-chrome—	
2/4% car. ..	£33 10 0
4/6% car. ..	£22 5 0
6/8% car. ..	£21 15 0
8/10% car. ..	£20 15 0
Ferro-chrome—	
Max. 2% car.	£37 0 0
Max. 1% car.	£43 10 0
Max. 0.70% car.	£54 10 0
70%, carbonless	1/5½ lb.
Nickel—99%, cubes or pellets ..	£170
Cobalt metal—98/99%	10/- lb.
Aluminium 98/99%	£112
Metallic Chromium—	
96/98% ..	3/3 lb.
Ferro-manganese (net)—	
76/80%, loose	£15 0 0
76/80%, packed	£16 0 0
76/80%, export	£14 5 0
Metallic manganese—	
94/96%, carbonless	2/- lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten ..	s. d. 2 6
Finished bars, 18% tungsten ..	3 0

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares 3 in. and over ..	4d. lb.
Rounds and squares under ½ in. to ¼ in.	3d. lb.
Do. under ¼ in. to ⅛ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do. under ½ in. × ¼ in.	1/- lb
Bevels of approved sizes and sections	6d. lb.
Bars cut to length	10% extra
Scrap from high-speed tool steel—	
Scrap pieces	3d.
Turnings and swarf	1d.

Per lb. net, d/d steel makers' works.

SCRAP.

South Wales—	£	s.	d.
Hvy. steel	3	7	6
Bundled steel & shrngs.	3 3 0 to 3	6	0
Mixed iron & steel	3 0 0 to 3	2	6
Heavy cast iron	3 2 6 to 3	5	0
Good machinery for foundries ..	3	7	6
Cleveland—			
Heavy steel ..	3	1	0
Steel turnings ..	2	6	0
Cast iron borings	2	5	0
Heavy forge ..	4	2	6
Bushelled scrap	3	10	0
Cast-iron scrap	3	7	6
Lancashire—			
Cast-iron scrap	3 2 6 to 3	10	0
Hvy. wrought ..	3	2	6
Steel turnings ..	2	2	0

London — Merchants' buying prices delivered yard.

Copper (clean)..	48	0	0
Brass (clean) ..	38	0	0
Lead (less usual draft)	26	0	0
Tea lead ..	21	0	0
Zinc	22	0	0
New aluminium cuttings ..	78	0	0
Braziery copper	44	0	0
Gunmetal ..	44	0	0
Hollow pewter	170	0	0
Shaped black pewter ..	126	0	0

PIG-IRON.

(*f.o.t. unless otherwise stated*).

N.E. Coast—	
Foundry No. 1 ..	78/-
Foundry No. 3 ..	75/-
Foundry No. 4 ..	74/-
Forge No. 4	73/6
Hematite No. 1 ..	78/6
Hematite M/Nos. ..	78/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	86/3
„ d/d Birm.	95/-
Midlands—	
Staffs. common* ..	—
„ No. 4 forge ..	—
„ No. 3 foundry	70/-
Shrops. basic	70/-
„ Cold blast, ord.*	185/-
„ „ roll iron* ..	190/-
* d/d Birmingham.	
Northants forge	—
„ fdry No. 3 ..	66/-
Derbyshire forge ..	—
„ fdry. No. 3 ..	70/-
„ basic	—
Scotland—	
Foundry No. 1 ..	82/-
„ No. 3 ..	77/-
Hem. M/Nos.	76/-
Sheffield (d/d district)—	
Derby forge	—
„ fdry. No. 3 ..	74/-
Lincs. forge	67/6
„ fdry. No. 3 ..	70/-
E.C. hematite	—
W.C. hematite ..	—
Lincs. (at furnaces)—	
Forge No. 4	61/6
Foundry No. 3.. ..	64/-
Basic	63/-
Lancashire (d/d eq. Man.)—	
Derby forge	—
„ fdry. No. 3 ..	74/-
Northants foundry No. 3	77/-
Dalzell, No. 3	110/-
Summerlee, No. 3 ..	97/6
Glengarnock, No. 3 ..	97/6
Gartsherrie, No. 3 ..	97/6
Monkland No. 3	97/6
Coltness, No. 3	97/6
Shotts, No. 3	97/6

FINISHED IRON & STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars(cr.)	11	0	0 to 12	0	0	
Angles			11	10	0	
Tees to 3 united ins.			12	0	0	
Nut and bolt	10	5	0 to 10	7	6	
Hoops	14	0	0 to 15	0	0	
Marked bars (Staffs.) f.o.t. ..			14	0	0	
Gas strip			12	10	0	
Bolts and nuts ¾ in. × 4 in. ..			15	5	0	
Steel—						
Ship plates	7	12	6 to 7	17	6	
Boiler plts. ..			11	5	0	
Chequer plts. ..			9	15	0	
Angles			7	2	6	
Tees			8	2	6	
Joists			7	2	6	
Rounds and Squares 3 in. to 5½ ins. ..			8	0	0	
Rounds under 3 in. to ⅜ in.			7	15	0	
Flats, over 5 in. wide and up ..			8	10	0	
Flats, 5in. to 1½in.			7	10	0	
Rails, heavy ..			8	0	0	
Fishplates			12	0	0	
Hoops (Staffs.) ..			10	10	0	
Black sheets, 24g.			10	17	6	
Galv. cor. sheets, 24g.			15	15	0	
Galv. fencing wire 8g. plain			13	0	0	
Billets, soft ..			6	5	0	
Billets, hard ..			8	2	6	
Sheet bars	6	0	0 to 6	2	6	
Tin bars d/d	6	2	6 to 6	5	0	

PHOSPHOR BRONZE.

	Per lb.	basis.
Strip	1	3
Sheet to w.g.	1	3½
Wire	1	3½
Rods	1	3
Tubes	1	8
Castings	1	2

Delivery 3 cwt. free

10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.

C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	9d. to 1/3
Rolled—	
To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3½ to 1/9½
To 15 in. wide	1/3½ to 1/9½
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4½ to 1/10½
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks ..	9d. to 1/5½
Ingots rolled to spoon size ..	1/- to 1/8½
Wire round—	
3/0 to 10 G.	1/6½ to 2/1½

with extras according to gauge.

AMERICAN IRON & STEEL.

At Pittsburgh unless otherwise stated.	Dols.
No. 2X foundry, Phila.	22.76
No. 2 foundry, Valley	20.26
No. 2 foundry, Birm.	22.00
Basic	19.76
Bessemer	20.76
Malleable	20.26
Grey forge	19.76
Ferro-mang. 80% d/d	88.00
Bess. rails, h'y, at mill	43.00
O.-h. rails, h'y at mill	43.00
Bess billets	35.00
O.-h. billets	35.00
O.-h. sheet bars ..	36.00
Wire rods	45.00
	Cents.
Iron bars, Phila. ..	2.22
Steel bars	1.90
Tank plates	1.85
Beams, etc.	1.90
Skelp, grooved steel ..	1.90
Skelp, sheared steel ..	1.90
Steel hoops	2.50
Sheets, black, No. 28..	3.15
Sheets, galv., No. 28 ..	4.40
Sheets, blue an'l'd, 9 & 10	2.40
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv. ..	3.35
Tinplate, 100 lb. box	$5.50

COKE (at ovens).

Welsh foundry ..	32/6 to 40/-
„ furnace ..	20/- to 25/-
Durham & North.	
„ foundry	30/- to 33/-
„ furnace	14/- to 14/6
Other Districts, foundry	30/- to 33/-
„ „ furnace (basis)	11/9

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes,	20×14, box	19/10½
„	28×20, „	39/9
„	20×10, „	29/9
„	18¾×14, „	20/9
C.W.	20×14, „	18/1½
„	28×20, „	36/3
„	20×10, „	25/1½
„	18¾×14, „	19/-

Terneplates 28×20, 36/6 per box basis f.o.b.

SWEDISH IRON.

Bars, hammered	£18/10 to £19/0
Rolled Ord.	£15/15/0 to £16/5/0
Nail rods	£16 5 0 to £16 15 0
Keg. steel nom.	£33 to £35
Faggot steel nom.	£22 to £25
Blooms, according to quality	£9 to £12
Pig-iron	£6 5 0 to £7 0 0

all f.o.b. Gothenburg.

TUBES AND FITTINGS.
Up to and incl. 6 in.

	Tubes	*Fittings*
Gas	60%	50%
Water	55%	45%
Steam	50%	40%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (Cash).

	£	s.	d.	
June 3	56	2	6	dec. 2/6
„ 4	56	2	6	No change
„ 7	56	2	6	„ „
„ 8	56	5	0	inc. 2/6
„ 9	56	12	6	„ 7/6

Electrolytic Copper.

	£	s.	d.	
June 3	64	0	0	No change
„ 4	64	0	0	„ „
„ 7	64	0	0	„ „
„ 8	64	5	0	inc. 5/-
„ 9	64	10	0	„ 5/-

Standard Tin (Cash).

	£	s.	d.	
June 3	263	15	0	inc. 20/-
„ 4	262	0	0	dec. 35/-
„ 7	261	5	0	dec. 15/-
„ 8	261	12	6	inc. 7/6
„ 9	265	15	0	„ 82/6

Tin (English ingots).

	£	s.	d.	
June 3	261	10	0	inc 10/-
„ 4	260	0	0	dec. 30/-
„ 7	259	0	0	dec. 20/-
„ 8	259	0	0	No change
„ 9	264	0	0	inc. 100/-

Zinc Sheets (English).

	£	s.	d.	
June 3	41	0	0	No change
„ 4	41	0	0	„ „
„ 7	41	0	0	„ „
„ 8	41	0	0	„ „
„ 9	41	0	0	„ „

Spelter (ordinary).

	£	s.	d.	
June 3	32	10	0	inc. 3/9
„ 4	32	10	0	No change
„ 7	32	12	6	inc. 2/6
„ 8	32	18	9	inc. 6/3
„ 9	33	5	0	„ 6/3

Lead (English).

	£	s.	d.	
June 3	30	15	0	No change
„ 4	30	15	0	„ „
„ 7	30	10	0	dec. 5/-
„ 8	30	10	0	No change
„ 9	31	0	0	inc. 10/-

AVERAGE MONTHLY PRICES OF STEEL SHIP PLATES IN ENGLAND.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1896	5 0 0	5 0 0	5 2 6	5 2 6	5 2 6	5 0 0	5 0 0	5 0 0	5 0 0	5 2 6	5 10 0	5 10 0	5 2 6
1897	5 10 0	5 10 0	5 10 0	5 7 6	5 2 6	5 2 6	5 0 0	5 0 0	5 0 0	5 0 0	5 7 6	5 10 0	5 5 5
1898	5 10 0	5 8 9	5 8 9	5 10 0	5 16 3	5 18 9	5 17 6	6 0 0	6 2 6	6 5 0	6 10 0	6 15 0	5 18 6½
1899	6 15 0	7 0 0	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 12 6	7 12 6	7 12 6	7 12 6	8 0 0	7 6 5½
1900	8 0 0	8 0 0	8 2 6	8 5 0	8 7 6	8 7 6	8 7 6	8 0 0	8 0 0	8 0 0	7 10 0	7 0 0	8 0 0
1901	6 15 0	6 15 0	6 5 0	6 0 0	6 0 0	6 0 0	6 0 0	6 5 0	6 7 6	6 5 0	6 0 0	6 0 0	6 4 4
1902	5 17 6	5 12 6	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 10 0	5 14 7½
1903	5 10 0	5 10 0	5 15 0	6 0 0	6 0 0	6 0 0	5 12 0	5 12 6	5 12 6	5 12 6	5 12 6	5 10 0	5 13 11
1904	5 7 6	5 10 0	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 11 10
1905	5 15 0	5 17 6	5 17 6	5 17 6	5 17 6	5 17 6	5 17 6	5 17 6	6 0 0	6 10 0	7 0 0	7 0 0	6 2 3½
1906	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 10 0	7 0 10½
1907	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 0 0	7 0 0	7 8 4
1908	6 10 0	6 10 0	6 10 0	6 5 0	6 5 0	6 5 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 3 9
1909	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	5 15 0	5 15 0	5 15 0	6 0 0	6 0 0	6 0 0	6 0 0	5 18 9
1910	6 5 6	6 5 0	6 7 6	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 15 0	6 15 0	6 15 0	6 10 2
1911	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 15 0	6 18 4	6 15 3½
1912	7 3 9	7 5 0	7 5 0	7 12 6	7 15 0	7 15 0	7 15 0	8 0 0	8 0 0	8 0 0	8 2 0	8 5 0	7 14 10
1913	8 5 0	8 5 0	8 5 0	8 5 0	8 5 0	8 5 0	8 5 0	7 19 0	7 15 0	7 3 0	6 15 0	6 10 0	7 16 5½
1914	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 0 0	6 0 0	7 0 0	7 5 0	7 5 0	7 6 3	7 10 0	6 14 8¼
1915	8 0 0	8 10 0	9 0 0	9 10 0	9 10 0	10 0 0	10 0 0	10 0 0	10 0 0	10 0 0	10 5 0	11 0 0	9 12 11
1916	11 7 6	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 9 2
1917	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0
1918	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0
1919	11 10 0	14 0 0	14 0 0	14 0 0	17 0 0	17 7 6	17 15 0	18 5 0	18 5 0	18 5 0	19 12 6	21 5 0	16 15 5
1920	22 10 0	23 10 0	23 10 0	23 10 0	23 10 0	23 10 0	23 10 0	23 10 0	24 0 0	24 10 0	24 5 0	24 5 0	23 13 4
1921	23 5 0	22 10 0	20 4 0	19 0 0	19 0 0	17 0 0	15 0 0	14 15 0	13 12 0	12 5 0	10 10 0	10 10 0	16 9 3
1922	10 10 0	10 10 0	10 10 0	10 10 0	10 10 0	10 4 0	10 0 0	9 7 6	9 4 0	9 5 0	9 5 0	9 5 0	9 18 4½
1923	9 7 6	9 15 0	10 5 0	10 10 0	10 10 0	10 10 0	9 18 9	9 17 6	9 17 6	9 17 6	9 18 6	10 6 10½	10 1 2½
1924	10 1 6	9 18 1½	9 17 6	9 17 6	9 17 6	9 19 4½	10 5 0	10 5 0	10 5 0	9 19 0	9 15 0	9 15 0	9 19 7½
1925	9 14 0	9 10 0	9 10 0	9 1 3	9 0 0	9 0 0	8 17 0	8 13 1½	8 7 6	8 5 6	7 16 3	7 14 3	8 15 8½
1926	7 12 2½	7 12 6	7 12 6	7 14 4½	7 15 0	—	—	—	—	—	—	—	7 13 3¹

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

18, BENNETTS HILL, BIRMINGHAM.
11, OLD HALL STREET, LIVERPOOL.
EXCHANGE BLDGS., PORT TALBOT.
FOWLERS BUILDINGS, BOMBAY.
CLIVE STREET, CALCUTTA.
ANGAPPA NAICK STREET, MADRAS.

REGISTERED TRADE MARK
LIMPET

1, HONG KONG ROAD, SHANGHAI.
OCEAN BUILDING, SINGAPORE.
JAVA STREET, KUALA LUMPUR
5, SHAFFRAZ ROAD, RANGOON.
COX'S BUILDINGS, KARACHI.
P.O. BOX 1580, CAIRO.

PIG IRON

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.,

NON-FERROUS METALS

COPPER, TIN. LEAD, SPELTER, ANTIMONY, CHROME ORE

WILLIAM JACKS & COMPANY,

19, ST. VINCENT PLACE, GLASGOW.

ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

Notice.

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 7 words per line. Minimum charge for one insertion 3/-.

SITUATIONS VACANT AND WANTED.

POSITION wanted as Foundry Manager, or Foreman, by a first-class Foundryman of wide experience and practical knowledge; thoroughly up to date and familiar with every detail connected with foundry work.—Box 742, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

GENTLEMAN, with connection among Foundries on Tyneside and North of England, seeks position as Representative for Foundry Facings and Requisites or good Agencies; attending Exhibition in London from June 15th to 18th.—Write, Box 744, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FETTLER required for Ironfoundry to undertake fettling on tonnage basis; approximate output 15/20 tons per week.—State full particulars and price per ton to Box 746, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

REQUIRED, Foundry Foreman for Iron Foundry producing High-class Machine Tool Castings; applicant must have previously held successfully a similar position and be used to heavy and light castings in loam, dry and green sand; high production and efficiency in the mixing of metals essential.—State full particulars of experience, age and wages required, to Box 748, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WORKS MANAGER or FOREMAN required by large firm; must have had considerable experience in up-to-date manufacture of Graphite Crucibles, etc.; good salary will be paid to a fully competent man.—Apply, Box 740, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PROPERTY.

OLD-ESTABLISHED Iron and Brass Foundry (outer London district) for Sale as a going concern; Company's output approximately £6,000 per annum, but capable of improvement; favourable situation and excellent railway facilities.—Apply in the first instance to CHAS. W. ROOKE & COMPANY, Chartered Accountants, 2, Norfolk Street, Strand, W.C.2.

PATENTS.

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